

US011466449B2

(12) **United States Patent**  
**Pilz et al.**

(10) **Patent No.:** **US 11,466,449 B2**  
(45) **Date of Patent:** **Oct. 11, 2022**

(54) **FIRE-RATED WALL AND CEILING SYSTEM**

(71) Applicant: **CALIFORNIA EXPANDED METAL PRODUCTS COMPANY**, City of Industry, CA (US)

(72) Inventors: **Donald Anthony Pilz**, Livermore, CA (US); **Raymond Edward Poliquin**, City of Industry, CA (US); **Fernando Hernandez Sesma**, City of Industry, CA (US)

(73) Assignee: **CALIFORNIA EXPANDED METAL PRODUCTS COMPANY**, City of Industry (CA)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 84 days.

(21) Appl. No.: **16/845,535**

(22) Filed: **Apr. 10, 2020**

(65) **Prior Publication Data**  
US 2020/0340240 A1 Oct. 29, 2020

**Related U.S. Application Data**

(63) Continuation of application No. 16/253,653, filed on Jan. 22, 2019, now Pat. No. 10,619,347, which is a (Continued)

(51) **Int. Cl.**  
**E04B 1/94** (2006.01)  
**E04B 2/58** (2006.01)  
(Continued)

(52) **U.S. Cl.**  
CPC ..... **E04B 1/944** (2013.01); **E04B 1/24** (2013.01); **E04B 1/947** (2013.01); **E04B 1/948** (2013.01);  
(Continued)

(58) **Field of Classification Search**  
CPC ..... E04B 1/944; E04B 1/947; E04B 1/948; E04B 2/58; E04B 2/60; E04B 1/24;  
(Continued)

(56) **References Cited**  
**U.S. PATENT DOCUMENTS**  
661,832 A 11/1900 Wilkinson  
965,595 A 7/1910 Nicholson  
(Continued)

**FOREIGN PATENT DOCUMENTS**

CA 2234347 10/1999  
CA 2711659 2/2012  
(Continued)

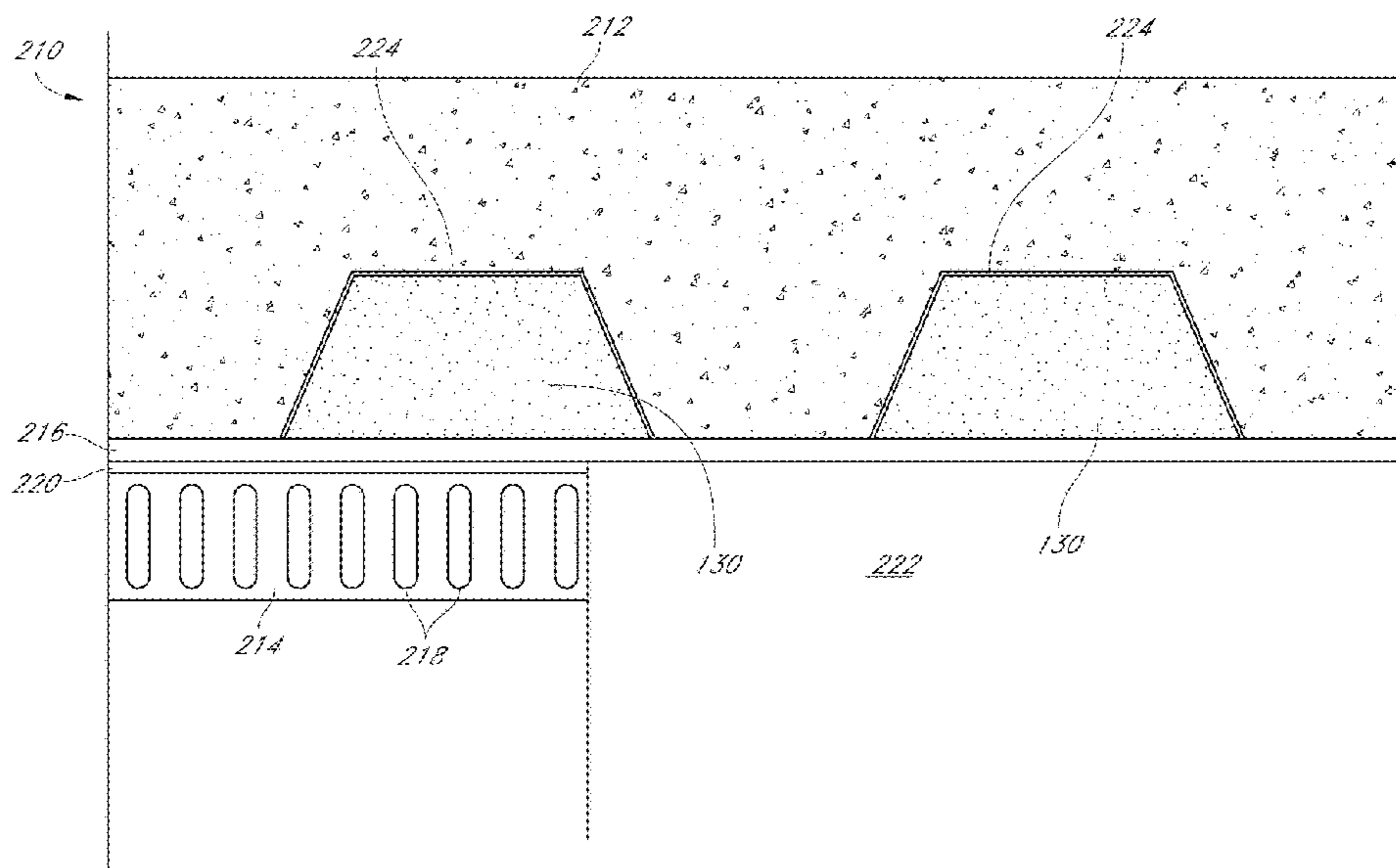
**OTHER PUBLICATIONS**

U.S. Appl. No. 15/285,440, filed Oct. 4, 2016, Pilz.  
(Continued)

*Primary Examiner* — Brent W Herring  
(74) *Attorney, Agent, or Firm* — Knobbe, Martens, Olson & Bear LLP

(57) **ABSTRACT**  
The present application is directed toward fire-rated wall construction components and wall systems for use in building construction. Embodiments can include tracks for holding studs which incorporate various geometries capable of receiving fire-retardant material, flat straps for use between tracks and fluted wall components, fire sponges for use in fluted wall components, and tracks with protruding grooves or other structures which prevent unwanted air movement between a wallboard component and the track.

**26 Claims, 14 Drawing Sheets**



**Related U.S. Application Data**

continuation of application No. 15/986,280, filed on May 22, 2018, now Pat. No. 10,214,901, which is a continuation of application No. 15/680,072, filed on Aug. 17, 2017, now Pat. No. 10,011,983, which is a continuation of application No. 15/337,972, filed on Oct. 28, 2016, now Pat. No. 9,739,052, which is a continuation of application No. 14/844,966, filed on Sep. 3, 2015, now Pat. No. 9,481,998, which is a continuation of application No. 14/284,297, filed on May 21, 2014, now Pat. No. 9,127,454, which is a continuation of application No. 13/691,595, filed on Nov. 30, 2012, now Pat. No. 9,637,914, which is a continuation of application No. 13/217,145, filed on Aug. 24, 2011, now Pat. No. 8,322,094, which is a continuation of application No. 12/196,115, filed on Aug. 21, 2008, now Pat. No. 8,087,205, which is a continuation-in-part of application No. 12/013,361, filed on Jan. 11, 2008, now Pat. No. 7,617,643.

(60) Provisional application No. 60/957,434, filed on Aug. 22, 2007.

(51) **Int. Cl.**

*E04B 2/60* (2006.01)  
*E04C 3/32* (2006.01)  
*E04B 1/24* (2006.01)  
*E04B 2/82* (2006.01)  
*E04B 2/76* (2006.01)  
*E04B 2/74* (2006.01)  
*E04C 3/04* (2006.01)

(52) **U.S. Cl.**

CPC ..... *E04B 2/58* (2013.01); *E04B 2/60* (2013.01); *E04B 2/7411* (2013.01); *E04B 2/76* (2013.01); *E04B 2/82* (2013.01); *E04C 3/04* (2013.01); *E04C 3/32* (2013.01); *E04B 1/94* (2013.01); *E04B 2103/06* (2013.01); *E04C 2003/0404* (2013.01)

(58) **Field of Classification Search**

CPC . *E04B 2/82*; *E04B 2/76*; *E04B 2/7411*; *E04B 2103/06*; *E04B 1/94*; *E04B 9/008*; *E04C 3/32*; *E04C 3/04*; *E04C 2003/0404*; *E04C 2003/0434*; *E04C 2003/0439*; *E04C 2003/0473*; *E04C 3/29*

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,130,722 A 3/1915 Fletcher  
 1,563,651 A 12/1925 Pomerantz  
 2,105,771 A 1/1938 Holdsworth  
 2,114,386 A 4/1938 Killion  
 2,218,426 A 10/1940 Hulbert, Jr.  
 2,556,878 A 6/1951 Kohlhaas  
 2,664,739 A 1/1954 Marcy  
 2,683,927 A 7/1954 Maronek  
 2,733,786 A 2/1956 Drake  
 3,041,682 A 7/1962 Alderfer et al.  
 3,129,792 A 4/1964 Gwynne  
 3,271,920 A 9/1966 Downing, Jr.  
 3,309,826 A 3/1967 Zinn  
 3,324,615 A 6/1967 Zinn  
 3,346,909 A 10/1967 Blackburn  
 3,355,852 A 12/1967 Lally  
 3,397,495 A 8/1968 Thompson  
 3,460,302 A 8/1969 Cooper  
 3,481,090 A 12/1969 Lizee

3,537,219 A 11/1970 Navarre  
 3,562,985 A 2/1971 Nicosia  
 3,566,559 A 3/1971 Dickson  
 3,604,167 A 9/1971 Hays  
 3,609,933 A 10/1971 Jahn et al.  
 3,648,419 A 3/1972 Marks  
 3,668,041 A 6/1972 Lonning  
 3,683,569 A 8/1972 Holm  
 3,696,569 A 10/1972 Didry  
 3,707,819 A 1/1973 Calhoun et al.  
 3,713,263 A 1/1973 Mullen  
 3,730,477 A 5/1973 Wavrunek  
 3,744,199 A 7/1973 Navarre  
 3,757,480 A 9/1973 Young  
 3,786,604 A 1/1974 Kramer  
 3,837,126 A 9/1974 Voiturier et al.  
 3,839,839 A 10/1974 Tillisch et al.  
 3,866,370 A 2/1975 Guarino et al.  
 3,908,328 A 9/1975 Nelsson  
 3,921,346 A 11/1975 Sauer et al.  
 3,922,830 A 12/1975 Guarino et al.  
 3,934,066 A 1/1976 Murch  
 3,935,681 A 2/1976 Voiturier et al.  
 3,955,330 A 5/1976 Wendt  
 3,964,214 A 6/1976 Wendt  
 3,974,607 A 8/1976 Balinski  
 3,976,825 A 8/1976 Anderberg  
 3,998,027 A 12/1976 Wendt et al.  
 4,011,704 A 3/1977 O'Konski  
 4,103,463 A 8/1978 Dixon  
 4,122,203 A 10/1978 Stahl  
 4,130,972 A 12/1978 Varlonga  
 4,139,664 A 2/1979 Wenrick  
 4,144,335 A 3/1979 Edwards  
 4,144,385 A 3/1979 Downing  
 4,152,878 A 5/1979 Balinski  
 4,164,107 A 8/1979 Kraemling et al.  
 4,178,728 A 12/1979 Ortmanns et al.  
 4,203,264 A 5/1980 Kiefer et al.  
 4,205,498 A 6/1980 Unayama  
 4,217,731 A 8/1980 Saino  
 4,276,332 A 6/1981 Castle  
 4,281,494 A 8/1981 Weinar  
 4,283,892 A 8/1981 Brown  
 4,295,304 A 10/1981 Kim  
 4,318,253 A 3/1982 Wedel  
 4,329,820 A 5/1982 Wendt  
 4,356,672 A 11/1982 Beckman et al.  
 4,361,994 A 12/1982 Carver  
 4,424,653 A 1/1984 Heinen  
 4,434,592 A 3/1984 Renault et al.  
 4,437,274 A 3/1984 Slocum et al.  
 4,454,690 A 6/1984 Dixon  
 4,461,120 A 7/1984 Hemmerling  
 4,467,578 A 8/1984 Weinar  
 4,480,419 A 11/1984 Crites  
 4,495,238 A 1/1985 Adiletta  
 4,497,150 A 2/1985 Wendt et al.  
 4,507,901 A \* 4/1985 Carroll ..... E04B 7/00  
 52/220.1  
 4,517,782 A 5/1985 Shamszadeh  
 4,575,979 A 3/1986 Mariani  
 4,578,913 A 4/1986 Eich  
 4,598,516 A 7/1986 Groshong  
 4,622,794 A 11/1986 Geortner  
 4,632,865 A 12/1986 Tzur  
 4,649,089 A 3/1987 Thwaites  
 4,672,785 A 6/1987 Salvo  
 4,709,517 A 12/1987 Mitchell et al.  
 4,711,183 A 12/1987 Handler et al.  
 4,723,385 A 2/1988 Kallstrom  
 4,756,945 A 7/1988 Gibb  
 4,761,927 A 8/1988 O'Keefe et al.  
 4,787,767 A 11/1988 Wendt  
 4,805,364 A 2/1989 Smolik  
 4,810,986 A 3/1989 Leupold  
 4,822,659 A 4/1989 Anderson et al.  
 4,825,610 A 5/1989 Gasteiger  
 4,845,904 A 7/1989 Menchetti

(56)

## References Cited

## U.S. PATENT DOCUMENTS

4,850,385	A	7/1989	Harbeke	5,820,958	A	10/1998	Swallow
4,854,096	A	8/1989	Smolik	5,822,935	A	10/1998	Mitchell et al.
4,866,898	A	9/1989	LaRoche et al.	5,870,866	A	2/1999	Herndon
4,881,352	A	11/1989	Glockenstein	5,913,788	A	6/1999	Herren
4,885,884	A	12/1989	Schilger	5,921,041	A	7/1999	Egri, II
4,897,976	A	2/1990	Williams et al.	5,927,041	A	7/1999	Sedlmeier et al.
4,899,510	A	2/1990	Propst	5,930,963	A	8/1999	Nichols
4,914,880	A	4/1990	Albertini	5,930,968	A	8/1999	Pullman
4,918,761	A	4/1990	Harbeke	5,945,182	A	8/1999	Fowler et al.
4,930,276	A	6/1990	Bawa et al.	5,950,385	A	9/1999	Herren
4,935,281	A	6/1990	Tolbert et al.	5,968,615	A	10/1999	Schlappa
4,982,540	A	1/1991	Thompson	5,968,669	A	10/1999	Liu et al.
4,987,719	A	1/1991	Goodson, Jr.	5,970,672	A	10/1999	Robinson
5,010,702	A	4/1991	Daw et al.	5,974,750	A	11/1999	Landin et al.
5,090,170	A	2/1992	Propst	5,974,753	A	11/1999	Hsu
5,094,780	A	3/1992	von Bonin	6,023,898	A	2/2000	Josey
5,103,589	A	4/1992	Crawford	6,058,668	A	5/2000	Herren
5,105,594	A	4/1992	Kirchner	6,061,985	A	5/2000	Kraus et al.
5,111,579	A	5/1992	Andersen	6,110,559	A	8/2000	De Keyser
5,125,203	A	6/1992	Daw	6,116,404	A	9/2000	Heuft et al.
5,127,203	A	7/1992	Paquette	6,119,411	A	9/2000	Mateu Gil et al.
5,127,760	A	7/1992	Brady	6,128,874	A	10/2000	Olson et al.
5,140,792	A	8/1992	Daw et al.	6,128,877	A	10/2000	Goodman et al.
5,146,723	A	9/1992	Greenwood et al.	6,131,352	A	10/2000	Barnes et al.
5,152,113	A	10/1992	Guddas	6,151,858	A	11/2000	Ruiz et al.
5,155,957	A	10/1992	Robertson et al.	6,153,668	A	11/2000	Gestner et al.
5,157,883	A	10/1992	Meyer	6,176,053	B1	1/2001	St. Germain
5,157,887	A	10/1992	Watterworth, III	6,182,407	B1	2/2001	Turpin et al.
5,167,876	A	12/1992	Lem	6,189,277	B1	2/2001	Boscamp
5,173,515	A	12/1992	von Bonin et al.	6,207,077	B1	3/2001	Burnell-Jones
5,203,132	A	4/1993	Smolik	6,207,085	B1	3/2001	Ackerman
5,205,099	A	4/1993	Grunhage et al.	6,213,679	B1	4/2001	Frobosilo et al.
5,212,914	A	5/1993	Martin et al.	6,216,404	B1	4/2001	Vellrath
5,222,335	A	6/1993	Petrella	6,233,888	B1	5/2001	Wu
5,244,709	A	9/1993	Vanderstukken	6,256,948	B1	7/2001	Van Dreumel
5,279,091	A	1/1994	Williams et al.	6,256,960	B1	7/2001	Babcock et al.
5,285,615	A	2/1994	Gilmour	6,279,289	B1	8/2001	Soder et al.
5,315,804	A	5/1994	Attalla	6,305,133	B1	10/2001	Cornwall
5,319,339	A	6/1994	Leopold	6,318,044	B1	11/2001	Campbell
5,325,651	A	7/1994	Meyer et al.	6,374,558	B1	4/2002	Surowiecki
5,347,780	A	9/1994	Richards et al.	6,381,913	B2	5/2002	Herren
5,367,850	A	11/1994	Nicholas	6,405,502	B1	6/2002	Cornwall
5,374,036	A	12/1994	Rogers et al.	6,408,578	B1	6/2002	Tanaka et al.
5,376,429	A	12/1994	McGroarty	6,430,881	B1	8/2002	Daudet et al.
5,390,458	A	2/1995	Menchetti	6,470,638	B1	10/2002	Larson
5,390,465	A	2/1995	Rajecki	6,487,825	B1	12/2002	Silik
5,394,665	A	3/1995	Johnson	6,595,383	B2	7/2003	Pietrantoni
5,412,919	A	5/1995	Pellock et al.	6,606,831	B2	8/2003	Degelsegger
5,433,991	A	7/1995	Boyd, Jr. et al.	6,647,691	B2	11/2003	Becker et al.
5,452,551	A	9/1995	Charland et al.	6,668,499	B2	12/2003	Degelsegger
5,454,203	A	10/1995	Turner	6,679,015	B1	1/2004	Cornwall
5,456,050	A	10/1995	Ward	6,698,146	B2	3/2004	Morgan et al.
5,460,864	A	10/1995	Heitkamp	6,705,047	B2	3/2004	Yulkowski
5,471,791	A	12/1995	Keller	6,711,871	B2	3/2004	Beirise et al.
5,471,805	A	12/1995	Becker	6,732,481	B2	5/2004	Stahl, Sr.
5,477,652	A	12/1995	Torrey et al.	6,739,926	B2	5/2004	Riach et al.
5,502,937	A	4/1996	Wilson	6,748,705	B2	6/2004	Orszulak
5,531,051	A	7/1996	Chenier, Jr. et al.	6,783,345	B2	8/2004	Morgan et al.
5,552,185	A	9/1996	De Keyser	6,792,733	B2	9/2004	Wheeler et al.
5,592,796	A	1/1997	Landers	6,799,404	B2	10/2004	Spransy
5,604,024	A	2/1997	von Bonin	6,843,035	B1	1/2005	Glynn
5,644,877	A	7/1997	Wood	6,854,237	B2	2/2005	Surowiecki
5,687,538	A	11/1997	Frobosilo et al.	6,871,470	B1	3/2005	Stover
5,689,922	A	11/1997	Daudet	6,951,162	B1	10/2005	Shockey et al.
5,709,821	A	1/1998	von Bonin et al.	7,043,880	B2	5/2006	Morgan et al.
5,724,784	A	3/1998	Menchetti	7,059,092	B2	6/2006	Harkins et al.
5,735,100	A	4/1998	Campbell	7,104,024	B1	9/2006	deGirolamo et al.
5,740,635	A	4/1998	Gil et al.	7,152,385	B2	12/2006	Morgan et al.
5,740,643	A	4/1998	Huntley	7,191,845	B2	3/2007	Loar
5,755,066	A	5/1998	Becker	7,240,905	B1	7/2007	Stahl
5,765,332	A	6/1998	Landin et al.	7,251,918	B2	8/2007	Reif et al.
5,787,651	A	8/1998	Horn et al.	7,302,776	B2	12/2007	Duncan et al.
5,797,233	A	8/1998	Hascall	7,398,856	B2	7/2008	Foster et al.
5,798,679	A	8/1998	Pissanetzky	7,413,024	B1	8/2008	Simontacchi et al.
5,806,261	A	9/1998	Huebner et al.	7,487,591	B2	2/2009	Harkins et al.
				7,497,056	B2	3/2009	Surowiecki
				7,506,478	B2	3/2009	Bobenhausen
				7,513,082	B2	4/2009	Johnson
				7,540,118	B2	6/2009	Jensen

(56)

References Cited

U.S. PATENT DOCUMENTS

7,594,331 B2	9/2009	Andrews et al.	9,458,628 B2	10/2016	Pilz et al.
7,603,823 B2	10/2009	Cann	9,481,998 B2	11/2016	Pilz et al.
7,610,725 B2	11/2009	Willert	9,506,246 B2	11/2016	Joseph et al.
7,617,643 B2	11/2009	Pilz et al.	9,512,614 B2	12/2016	Klein et al.
7,681,365 B2	3/2010	Klein	9,523,193 B2	12/2016	Pilz
7,685,792 B2	3/2010	Stahl, Sr. et al.	9,551,148 B2	1/2017	Pilz
7,716,891 B2	5/2010	Radford	9,616,259 B2	4/2017	Pilz et al.
7,735,295 B2	6/2010	Surowiecki	9,637,914 B2	5/2017	Pilz et al.
7,752,817 B2	7/2010	Pilz et al.	9,683,364 B2	6/2017	Pilz et al.
7,775,006 B2	8/2010	Giannos	9,719,253 B2	8/2017	Stahl, Jr. et al.
7,776,170 B2	8/2010	Yu et al.	9,739,052 B2	8/2017	Pilz et al.
7,797,893 B2	9/2010	Stahl, Sr. et al.	9,739,054 B2	8/2017	Pilz et al.
7,810,295 B2	10/2010	Thompson	9,752,318 B2	9/2017	Pilz
7,814,718 B2	10/2010	Klein	9,879,421 B2	1/2018	Pilz
7,827,738 B2	11/2010	Abrams et al.	9,885,178 B1	2/2018	Barnes et al.
7,836,652 B2	11/2010	Futterman	9,909,298 B2	3/2018	Pilz
7,866,108 B2	1/2011	Klein	9,931,527 B2	4/2018	Pilz et al.
7,870,698 B2	1/2011	Tonyan et al.	9,995,039 B2	6/2018	Pilz et al.
7,921,537 B2	4/2011	Rodlin	10,000,923 B2	6/2018	Pilz
7,921,614 B2	4/2011	Fortin et al.	10,011,983 B2	7/2018	Pilz et al.
7,941,981 B2	5/2011	Shaw	10,077,550 B2	9/2018	Pilz
7,950,198 B2	5/2011	Pilz et al.	10,166,418 B2	1/2019	Foerg et al.
7,984,592 B1	7/2011	Jiras	10,184,246 B2	1/2019	Pilz et al.
8,056,293 B2	11/2011	Klein	10,214,901 B2	2/2019	Pilz et al.
8,061,099 B2	11/2011	Andrews	10,227,775 B2	3/2019	Pilz et al.
8,062,108 B2	11/2011	Carlson et al.	10,246,871 B2	4/2019	Pilz
8,069,625 B2	12/2011	Harkins et al.	10,406,389 B2	9/2019	Pilz et al.
8,074,412 B1	12/2011	Gogan et al.	10,472,819 B2 *	11/2019	Klein ..... E04B 2/7409
8,074,416 B2	12/2011	Andrews	10,494,818 B2	12/2019	Maziarz
8,079,188 B2	12/2011	Swartz et al.	10,563,399 B2	2/2020	Pilz et al.
8,087,205 B2	1/2012	Pilz et al.	10,619,347 B2	4/2020	Pilz et al.
8,100,164 B2	1/2012	Goodman et al.	10,626,598 B2	4/2020	Klein
8,132,376 B2	3/2012	Pilz et al.	10,669,710 B2	6/2020	Förg
8,136,314 B2	3/2012	Klein	10,689,842 B2	6/2020	Pilz
8,151,526 B2	4/2012	Klein	10,731,338 B1	8/2020	Zemler et al.
8,181,404 B2	5/2012	Klein	10,753,084 B2	8/2020	Pilz et al.
8,225,581 B2	7/2012	Strickland et al.	10,900,223 B2	1/2021	Pilz
8,281,552 B2	10/2012	Pilz et al.	10,914,065 B2	2/2021	Pilz
8,322,094 B2	12/2012	Pilz et al.	10,920,416 B2	2/2021	Klein et al.
8,353,139 B2	1/2013	Pilz	10,954,670 B2	3/2021	Pilz
8,375,666 B2	2/2013	Stahl, Jr. et al.	11,041,306 B2	6/2021	Pilz et al.
8,413,394 B2	4/2013	Pilz et al.	11,060,283 B2	7/2021	Pilz et al.
8,468,759 B2 *	6/2013	Klein ..... E04B 1/94 52/241	11,111,666 B2	9/2021	Pilz
8,495,844 B1	7/2013	Johnson	11,141,613 B2	10/2021	Pilz et al.
8,499,512 B2	8/2013	Pilz et al.	11,162,259 B2	11/2021	Pilz
8,541,084 B2	9/2013	Deiss et al.	11,268,274 B2	3/2022	Pilz
8,544,226 B2	10/2013	Rubel	2002/0029535 A1	3/2002	Loper
8,555,566 B2	10/2013	Pilz et al.	2002/0160149 A1	10/2002	Garofalo
8,578,672 B2	11/2013	Mattox et al.	2002/0170249 A1	11/2002	Yulkowski
8,584,415 B2	11/2013	Stahl, Jr. et al.	2003/0079425 A1	5/2003	Morgan et al.
8,590,231 B2	11/2013	Pilz	2003/0089062 A1	5/2003	Morgan et al.
8,595,999 B1	12/2013	Pilz et al.	2003/0196401 A1	10/2003	Surowiecki
8,596,019 B2	12/2013	Aitken	2003/0213211 A1	11/2003	Morgan et al.
8,607,519 B2	12/2013	Hilburn	2004/0010998 A1	1/2004	Turco
8,640,415 B2	2/2014	Pilz et al.	2004/0016191 A1	1/2004	Whitty
8,646,235 B2	2/2014	Hilburn, Jr.	2004/0045234 A1	3/2004	Morgan et al.
8,671,632 B2	3/2014	Pilz et al.	2004/0139684 A1	7/2004	Menendez
8,728,608 B2	5/2014	Maisch	2004/0149390 A1	8/2004	Monden et al.
8,782,977 B2	7/2014	Burgess	2004/0211150 A1	10/2004	Bobenhausen
8,793,947 B2	8/2014	Pilz et al.	2005/0183361 A1	8/2005	Frezza
8,938,922 B2	1/2015	Pilz et al.	2005/0246973 A1	11/2005	Jensen
8,950,132 B2	2/2015	Collins et al.	2006/0032163 A1	2/2006	Korn
8,955,275 B2 *	2/2015	Stahl, Jr. .... E04B 2/7411 52/232	2006/0123723 A1	6/2006	Weir et al.
8,973,319 B2	3/2015	Pilz et al.	2006/0137293 A1	6/2006	Klein
9,045,899 B2	6/2015	Pilz et al.	2006/0213138 A1	9/2006	Milani et al.
9,127,454 B2	9/2015	Pilz et al.	2006/0261223 A1	11/2006	Orndorff, II et al.
9,151,042 B2	10/2015	Simon et al.	2007/0056245 A1	3/2007	Edmondson
9,206,596 B1	12/2015	Robinson	2007/0068101 A1	3/2007	Weir et al.
9,284,730 B2	3/2016	Klein	2007/0130873 A1	6/2007	Fisher
9,290,932 B2	3/2016	Pilz et al.	2007/0193202 A1	8/2007	Rice
9,290,934 B2	3/2016	Pilz et al.	2007/0261343 A1	11/2007	Stahl, Sr. et al.
9,316,133 B2	4/2016	Schnitta	2008/0087366 A1	4/2008	Yu et al.
9,371,644 B2	6/2016	Pilz et al.	2008/0134589 A1	6/2008	Abrams et al.
			2008/0172967 A1	7/2008	Hilburn
			2008/0196337 A1	8/2008	Surowiecki
			2008/0250738 A1	10/2008	Howchin
			2009/0049781 A1 *	2/2009	Pilz ..... E04C 3/04 52/481.1
			2009/0107064 A1	4/2009	Bowman

(56)

References Cited

U.S. PATENT DOCUMENTS

2009/0178369 A1 7/2009 Pilz et al.  
 2009/0223159 A1 9/2009 Colon  
 2009/0282760 A1 11/2009 Sampson et al.  
 2010/0199583 A1 8/2010 Behrens et al.  
 2011/0011019 A1 1/2011 Stahl, Jr. et al.  
 2011/0041415 A1 2/2011 Esposito  
 2011/0056163 A1 3/2011 Kure  
 2011/0067328 A1 3/2011 Naccarato et al.  
 2011/0099928 A1 5/2011 Klein et al.  
 2011/0146180 A1 6/2011 Klein  
 2011/0167742 A1 7/2011 Klein  
 2011/0185656 A1 8/2011 Klein  
 2011/0214371 A1 9/2011 Klein  
 2011/0274886 A1 11/2011 Flennert  
 2011/0302857 A1 12/2011 McClellan et al.  
 2012/0023846 A1 2/2012 Mattox et al.  
 2012/0066989 A1 3/2012 Pilz et al.  
 2012/0180414 A1 7/2012 Burgess  
 2012/0247038 A1 10/2012 Black  
 2012/0266550 A1 10/2012 Naccarato et al.  
 2012/0297710 A1 11/2012 Klein  
 2013/0086859 A1 4/2013 Pilz  
 2013/0118102 A1 5/2013 Pilz  
 2013/0205694 A1 8/2013 Stahl, Jr.  
 2014/0219719 A1 8/2014 Hensley et al.  
 2014/0260017 A1 9/2014 Noble, III  
 2015/0135622 A1 5/2015 Muenzenberger et al.  
 2015/0135631 A1 5/2015 Foerg  
 2015/0275506 A1 10/2015 Klein et al.  
 2015/0275507 A1 10/2015 Klein et al.  
 2015/0275510 A1 10/2015 Klein et al.  
 2015/0368898 A1 12/2015 Stahl, Jr. et al.  
 2016/0017598 A1 1/2016 Klein et al.  
 2016/0017599 A1 1/2016 Klein et al.  
 2016/0097197 A1 4/2016 Pilz  
 2016/0123003 A1 5/2016 Pilz  
 2016/0130802 A1 5/2016 Pilz  
 2016/0201319 A1 7/2016 Pilz  
 2016/0201893 A1 7/2016 Ksiezppolski  
 2016/0208484 A1 7/2016 Pilz  
 2016/0265219 A1 9/2016 Pilz  
 2016/0296775 A1 10/2016 Pilz  
 2017/0016227 A1 1/2017 Klein  
 2017/0130445 A1 5/2017 Pilz  
 2017/0175386 A1 6/2017 Pilz  
 2017/0191261 A9 7/2017 Pilz  
 2017/0198473 A1 7/2017 Pilz  
 2017/0234004 A1 8/2017 Pilz  
 2017/0234010 A1 8/2017 Klein  
 2017/0260741 A1 9/2017 Ackerman  
 2017/0306615 A1 10/2017 Klein et al.  
 2017/0328057 A1 11/2017 Pilz  
 2017/0209722 A1 12/2017 Pilz  
 2018/0010333 A1 1/2018 Foerg et al.  
 2018/0030723 A1 2/2018 Pilz  
 2018/0030726 A1 2/2018 Pilz  
 2018/0044913 A1 2/2018 Klein et al.  
 2018/0171624 A1 6/2018 Klein et al.  
 2018/0195282 A1 7/2018 Pilz  
 2018/0289994 A1 10/2018 Pilz  
 2018/0291619 A1 10/2018 Ackerman et al.  
 2018/0347189 A1 12/2018 Pilz  
 2018/0363293 A1 12/2018 Pilz  
 2019/0284797 A1 9/2019 Pilz  
 2019/0284799 A1 9/2019 Förg  
 2019/0316348 A1 10/2019 Pilz  
 2019/0316350 A1 10/2019 Pilz  
 2019/0323234 A1 10/2019 Watanabe et al.  
 2019/0330842 A1 10/2019 Pilz  
 2019/0338513 A1 11/2019 Pilz  
 2019/0344103 A1 11/2019 Pilz  
 2019/0360195 A1 11/2019 Pilz et al.  
 2020/0240140 A1 7/2020 Pilz  
 2020/0284030 A1 9/2020 Pilz  
 2020/0362551 A1\* 11/2020 Klein ..... E04B 1/88

2021/0017761 A1\* 1/2021 Klein ..... E04B 1/948  
 2021/0040731 A1 2/2021 Pilz  
 2021/0062502 A1\* 3/2021 Archer ..... E04B 1/944  
 2021/0148112 A1 5/2021 Klein  
 2021/0164222 A1 6/2021 Pilz  
 2021/0189721 A1\* 6/2021 Klein ..... E04B 2/7457  
 2021/0254333 A1 8/2021 Pilz  
 2021/0285208 A1 9/2021 Pilz  
 2021/0396004 A1 12/2021 Pilz  
 2022/0010553 A1 1/2022 Pilz  
 2022/0023684 A1 1/2022 Pilz  
 2022/0042303 A1 2/2022 Pilz  
 2022/0056686 A1 2/2022 Pilz  
 2022/0098856 A1\* 3/2022 Pilz ..... E04B 2/58

FOREIGN PATENT DOCUMENTS

CA 2697295 12/2013  
 CA 2736834 12/2015  
 CA 2803439 3/2017  
 CA 3010414 8/2017  
 CA 2827183 7/2018  
 CA 3036429 9/2019  
 CA 3041494 10/2019  
 CA 3041494 A1 \* 10/2019 ..... E04B 2/7457  
 CA 3052184 A1 \* 2/2020 ..... E04B 1/948  
 DE 60213279 T2 \* 7/2007 ..... E04B 2/7411  
 EP 0335347 A1 \* 10/1989 ..... E04B 1/948  
 EP 0 346 126 12/1989  
 EP 3 196 376 7/2017  
 EP 3 348 729 7/2018  
 ES 2268101 T3 \* 3/2007 ..... E04B 2/82  
 GB 2 159 051 11/1985  
 GB 2 411 212 8/2005  
 GB 2 424 658 10/2006  
 JP 06-042090 A 2/1994  
 JP 06-146433 5/1994  
 JP 06-220934 8/1994  
 JP 07-4620 U 1/1995  
 WO WO 2003/038206 5/2003  
 WO WO 2007/103331 9/2007  
 WO WO 2009/026464 2/2009  
 WO WO 2017/129398 8/2017  
 WO WO 2019/108295 6/2019

OTHER PUBLICATIONS

U.S. Appl. No. 15/462,671, filed Mar. 17, 2017, Pilz.  
 U.S. Appl. No. 15/469,370, filed Mar. 24, 2017, Pilz et al.  
 U.S. Appl. No. 15/481,272, filed Apr. 6, 2017, Pilz.  
 U.S. Appl. No. 15/655,688, filed Jul. 20, 2017, Pilz.  
 U.S. Appl. No. 15/680,025, filed Aug. 17, 2017, Pilz et al.  
 U.S. Appl. No. 15/912,313, filed Mar. 5, 2018, Pilz.  
 U.S. Appl. No. 15/943,349, filed Apr. 2, 2018, Pilz et al.  
 U.S. Appl. No. 16/598,211, filed Oct. 10, 2019, Pilz.  
 U.S. Appl. No. 16/791,869, filed Feb. 14, 2020, Pilz et al.  
 U.S. Appl. No. 16/809,401, filed Mar. 4, 2020, Pilz.  
 BlazeFrame 2009 catalog of products, available at least as of Mar. 4, 2010 from www.blazeframe.com, in 20 pages.  
 Canadian First Office Action for Application No. 2,697,295, dated Sep. 21, 2011, in 4 pages.  
 Canadian Second Office Action for Application No. 2,697,295, dated May 23, 2012, in 4 pages.  
 Canadian Office Action for Application No. 2,827,183, dated Mar. 27, 2015 in 4 pages.  
 Canadian Office Action for Application No. 2,827,183, dated Mar. 7, 2016 in 4 pages.  
 Catalog page from Stockton Products, printed from www.stocktonproducts.com, on Dec. 16, 2007, showing #5 Drip, in 1 page.  
 ClarkDietrich Building Systems, Product Submittal Sheet, (FTSC) Flat Trail Vertical Slide Clip. CD-FTSC11 Jul. 2011. 1 page.  
 DoubleTrack™ information sheets by Dietrich Metal Framing, in 2 pages; accessible on Internet Wayback Machine on Jul. 8, 2006.  
 FireStik™ by Cemco Brochure, published on www.firestik.us, in 18 pages; accessible on Internet Wayback Machine on Aug. 13, 2007.

(56)

**References Cited**

OTHER PUBLICATIONS

Information Disclosure Statement letter; U.S. Appl. No. 12/196,115, dated Aug. 4, 2011.

International Search Report for Application No. PCT/US2008/073920, dated Apr. 9, 2009.

“Intumescent Expansion Joint Seals”, Astroflame; [http://www.astroflame.com/intumescent\\_expansion\\_joint\\_seals](http://www.astroflame.com/intumescent_expansion_joint_seals); Jul. 2011; 4 pages.

James A. Klein’s Answer, Affirmative Defenses and Counterclaims to Third Amended Complaint; U.S. District Court, Central District of California; Case No. 2:12-cv-10791-DDP-MRWx; Filed Sep. 17, 2014; pp. 1-37.

Letter from Thomas E. Loop; counsel for defendant; Jun. 26, 2015.

Expert Report of James William Jones and exhibits; Case No. CV12-10791 DDP (MRWx); May 18, 2015.

Letter from Ann G. Schoen of Frost Brown Todd, LLC; Jun. 24, 2015.

“System No. HW-D-0607”, May 6, 2010, Metacaulk, [www.rectorseal.com](http://www.rectorseal.com), [www.metacault.com](http://www.metacault.com); 2008 Underwriters Laboratories Inc.; 2 pages.

Trim-Tex, Inc., TRIM-TEX Wall Mounted Deflection Bead Installation Instructions, 2 pages. [Undated. Applicant requests that the Examiner review and consider the reference as prior art for the purpose of examination.]

“Wall Mounted Deflection Bead,” Trim-Tex Drywall Products; Oct. 9, 2016; 3 pages.

U.S. Appl. No. 16/001,228, filed Jun. 6, 2018.

U.S. Appl. No. 16/112,118, filed Aug. 24, 2018.

U.S. Appl. No. 16/871,644, filed May 11, 2020, Pilz.

U.S. Appl. No. 17/305,653, filed Jul. 12, 2021, Pilz et al.

U.S. Appl. No. 17/303,173, filed May 21, 2021, Pilz et al.

U.S. Appl. No. 17/445,393, filed Aug. 18, 2021, Pilz.

U.S. Appl. No. 17/453,158, filed Nov. 1, 2021, Pilz.

\* cited by examiner

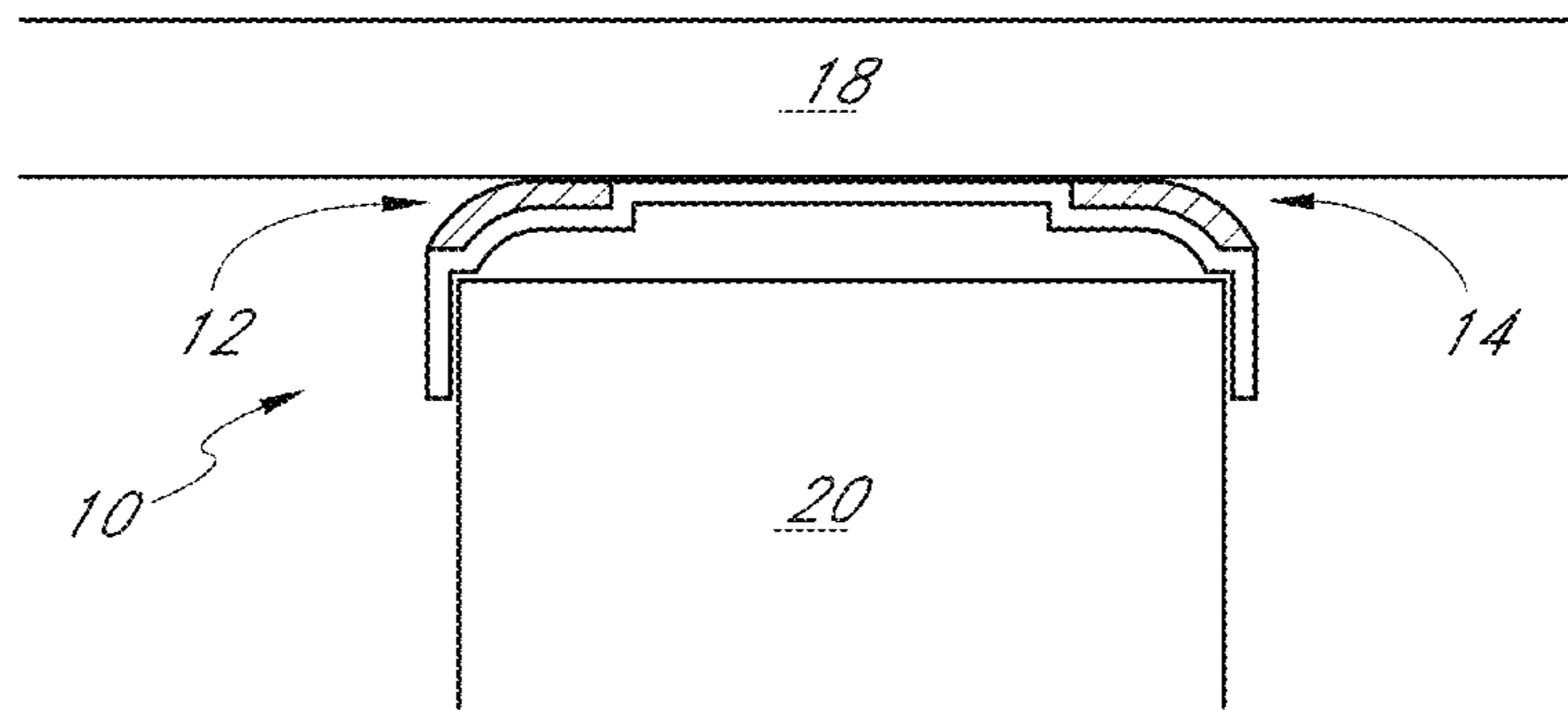


FIG. 1

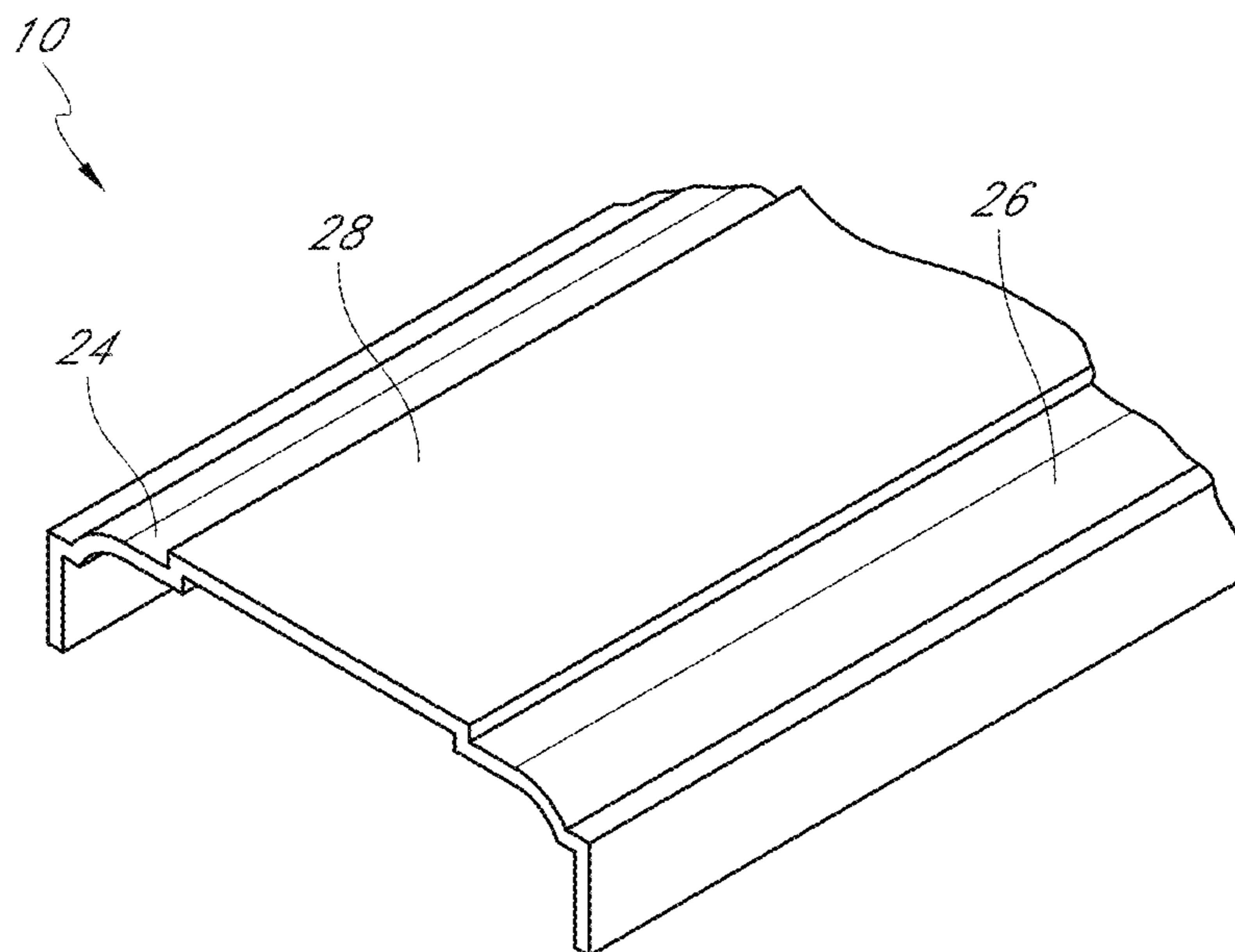


FIG. 2

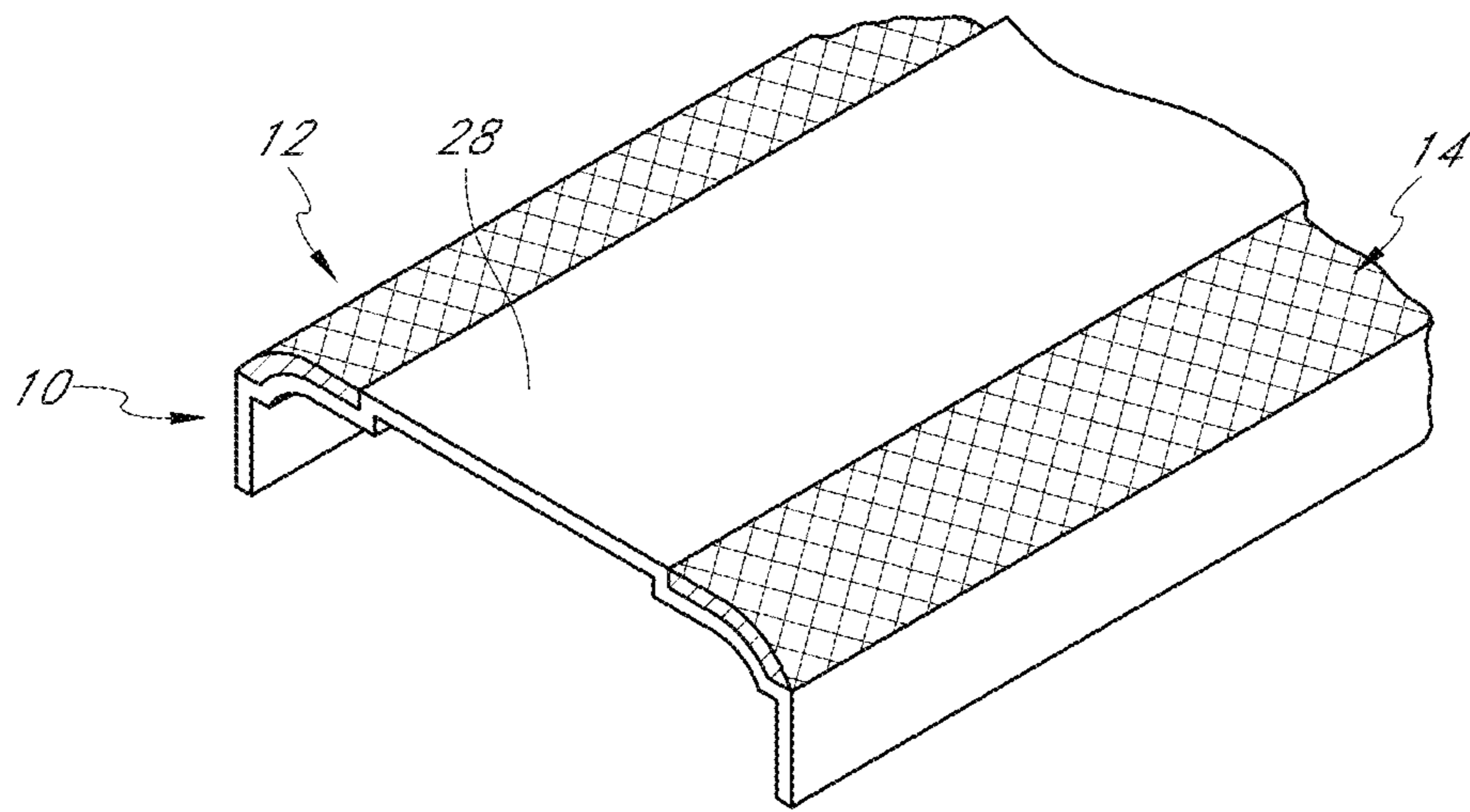


FIG. 3

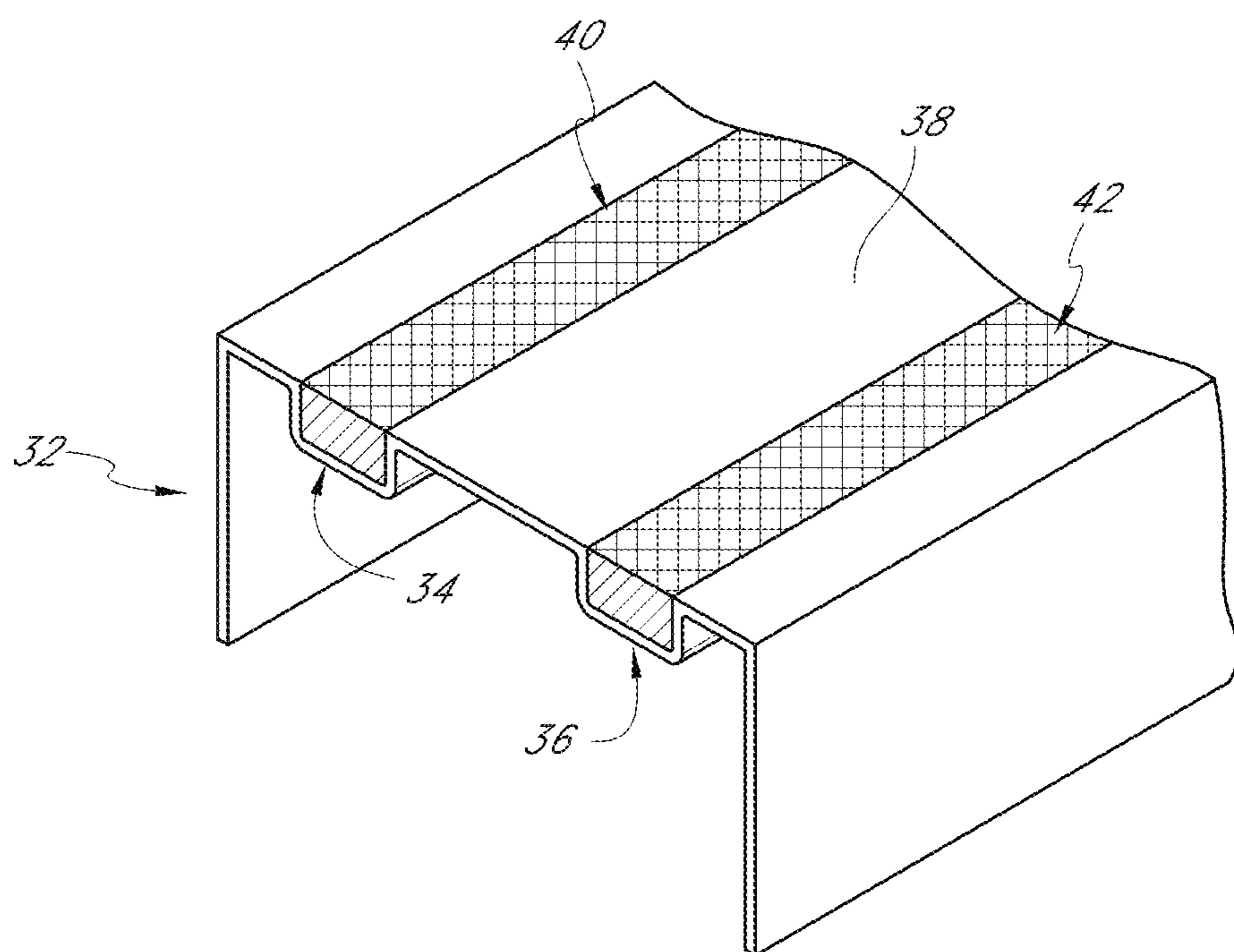


FIG. 4



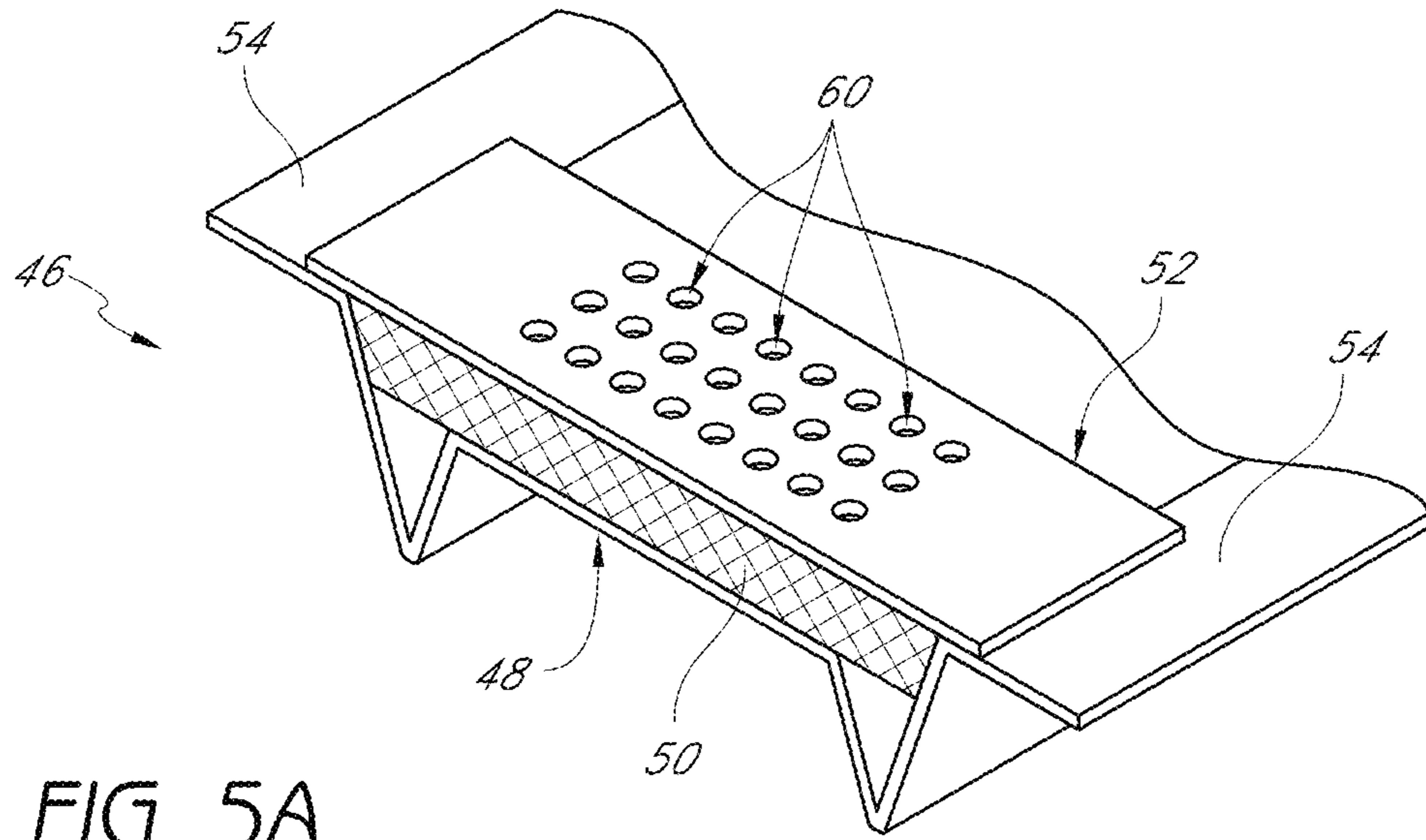


FIG. 5A

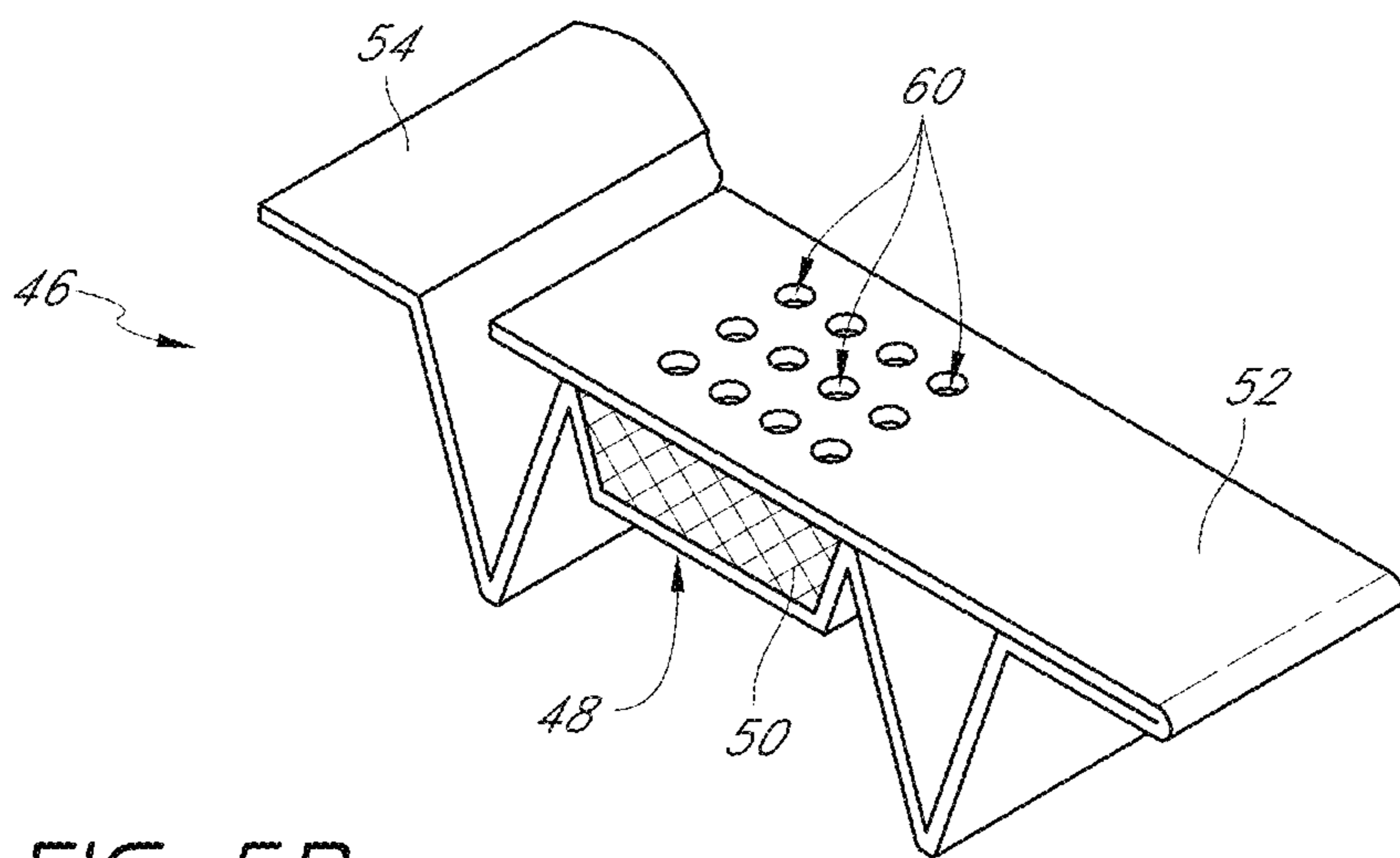


FIG. 5B

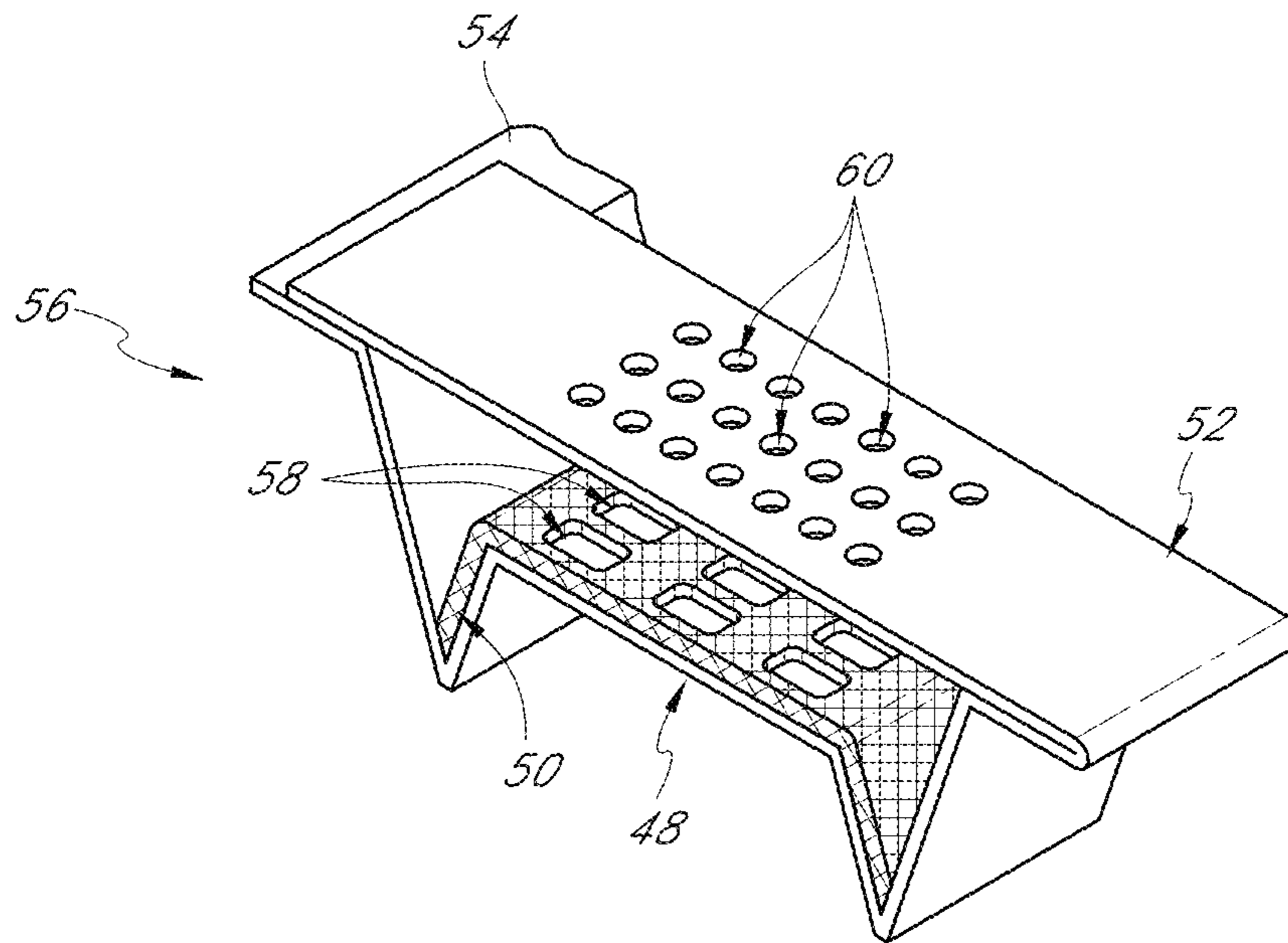


FIG. 6A

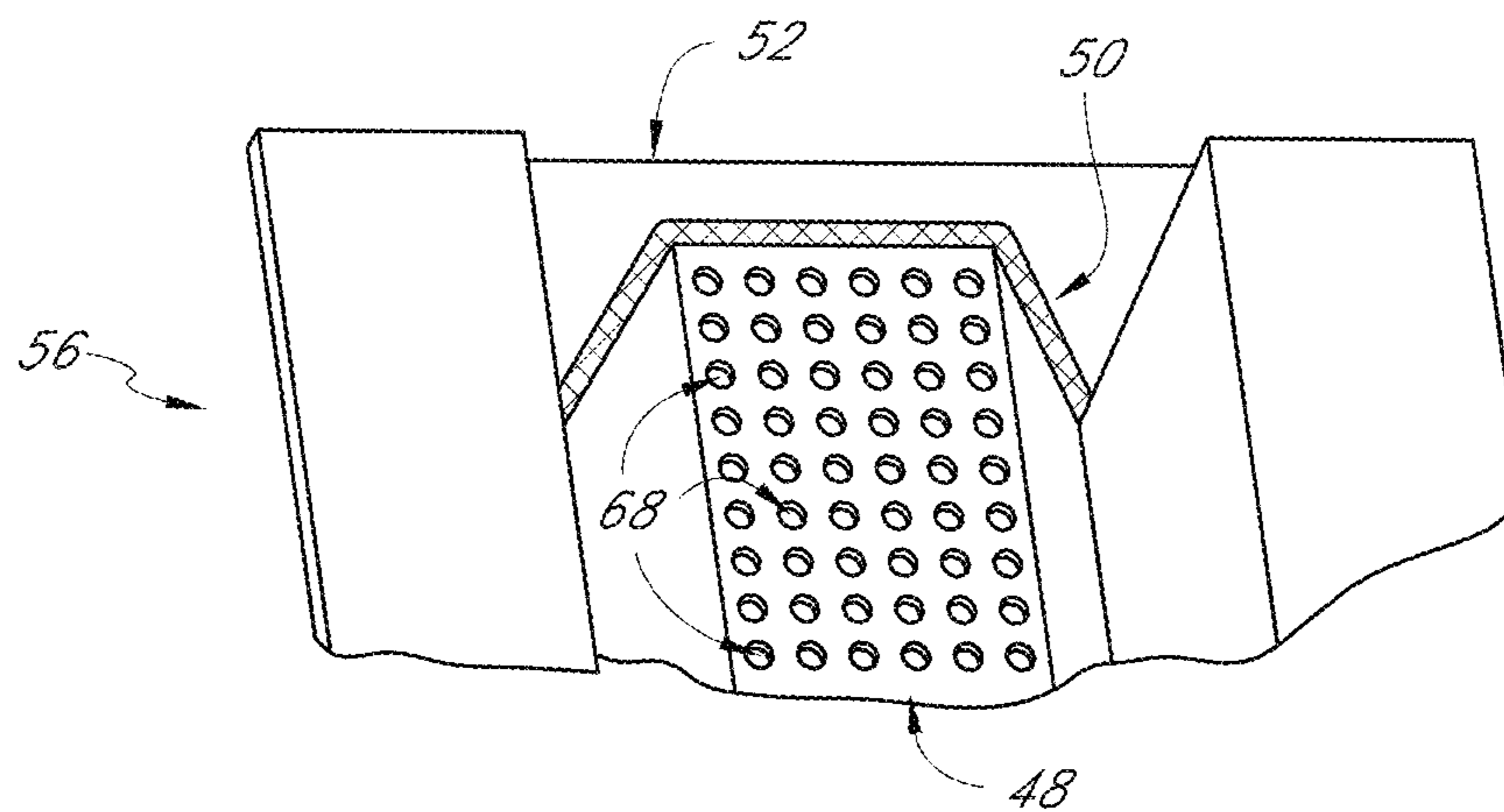


FIG. 6B

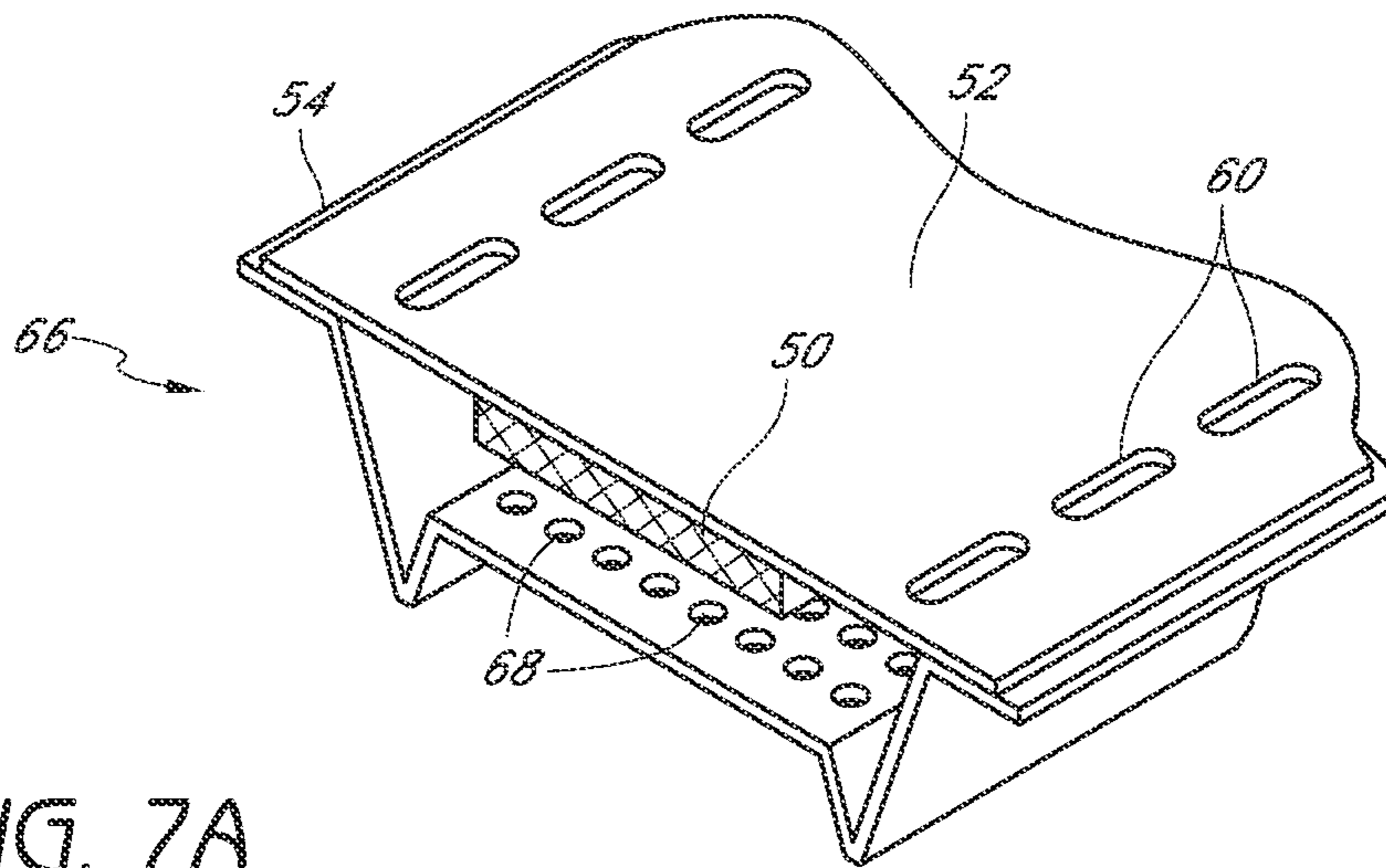


FIG. 7A

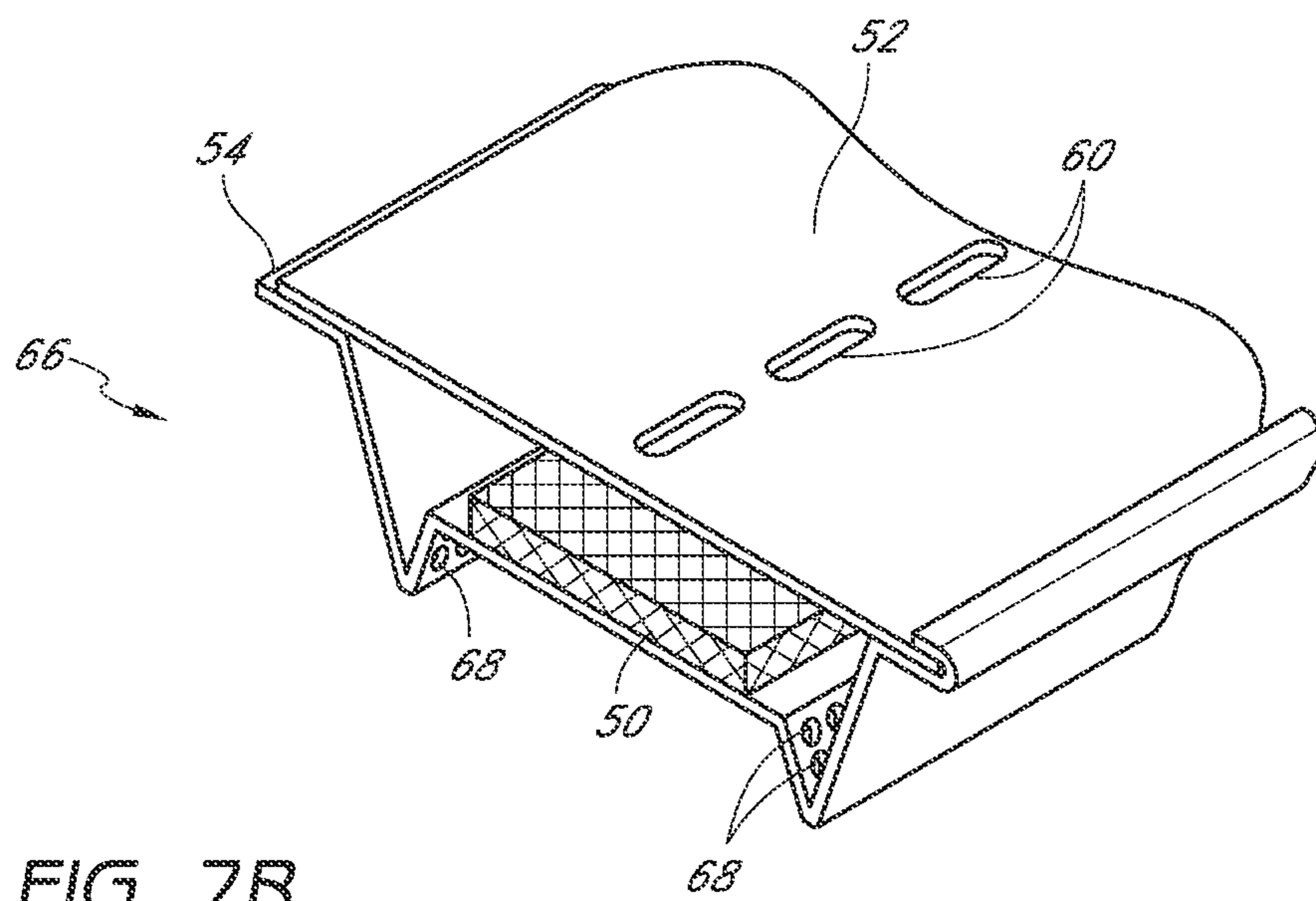


FIG. 7B

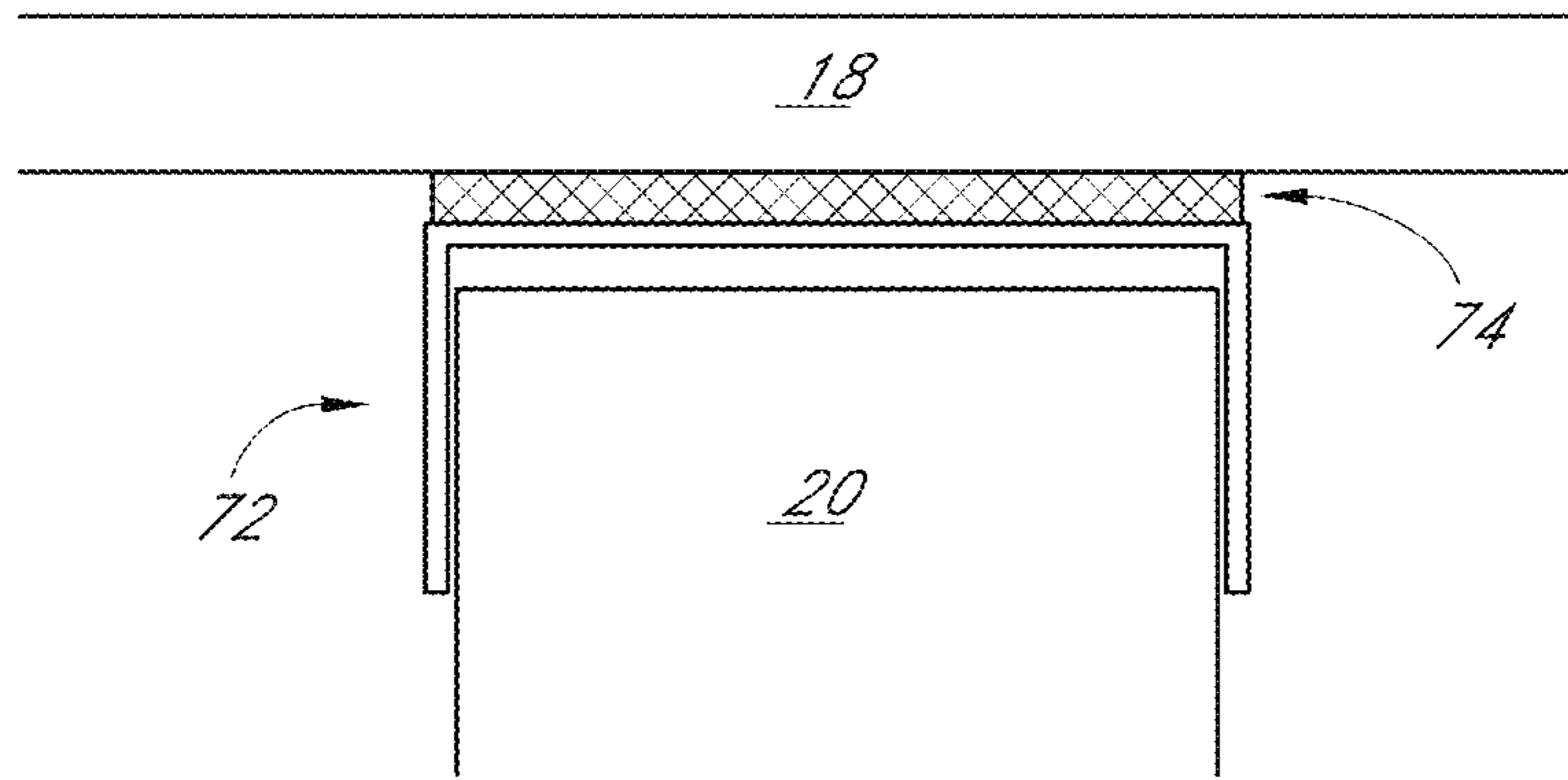


FIG. 8

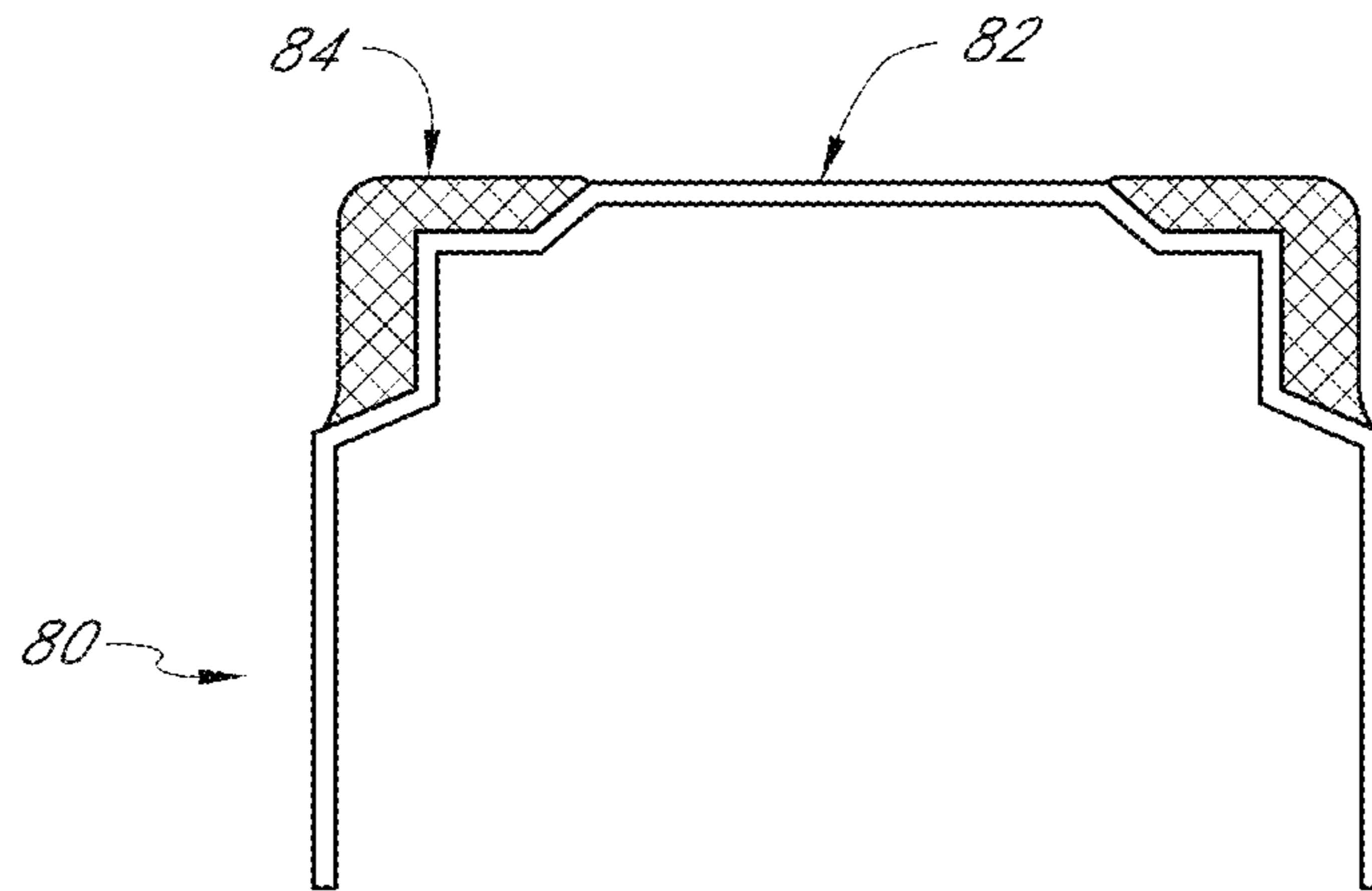


FIG. 9

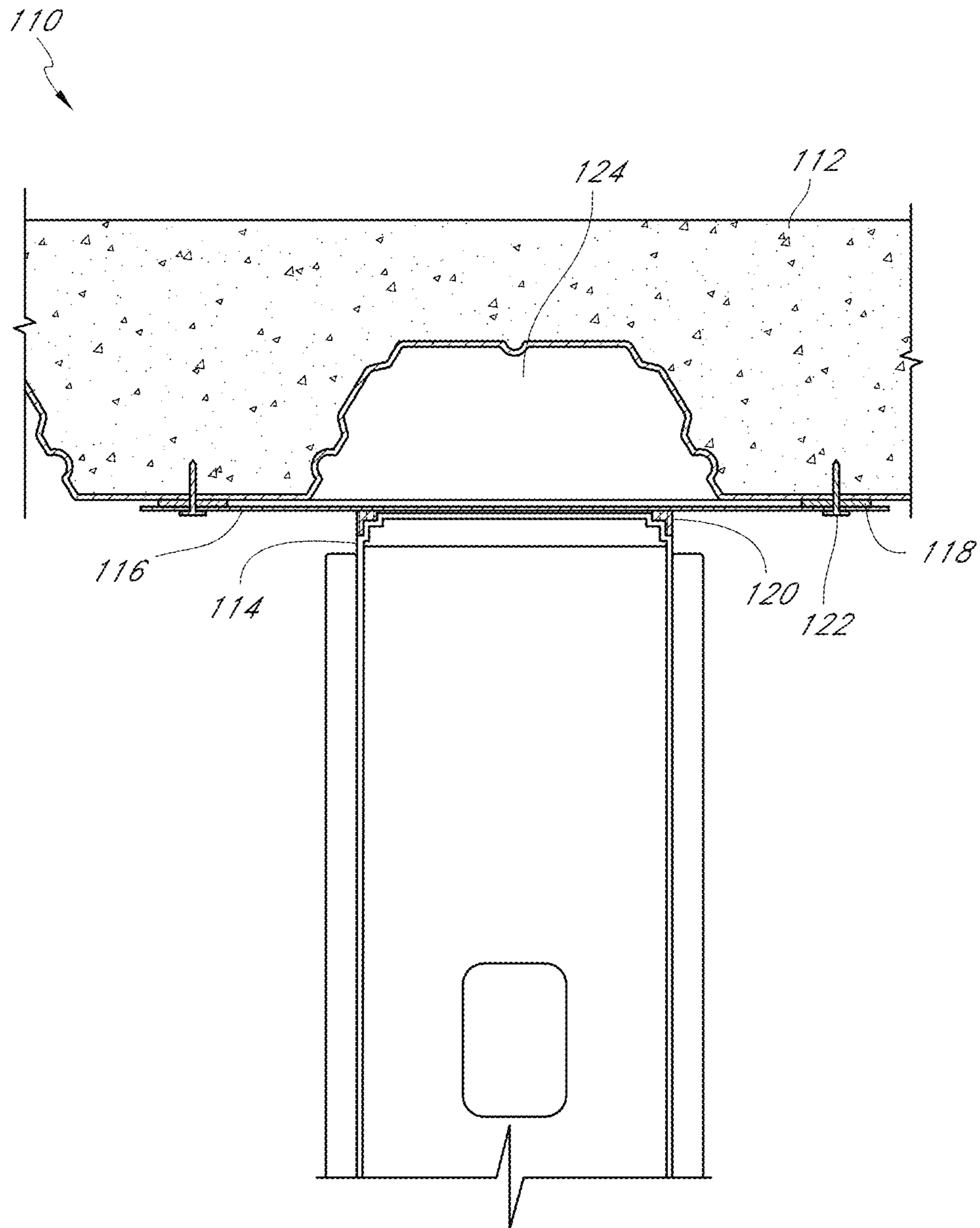


FIG. 10A

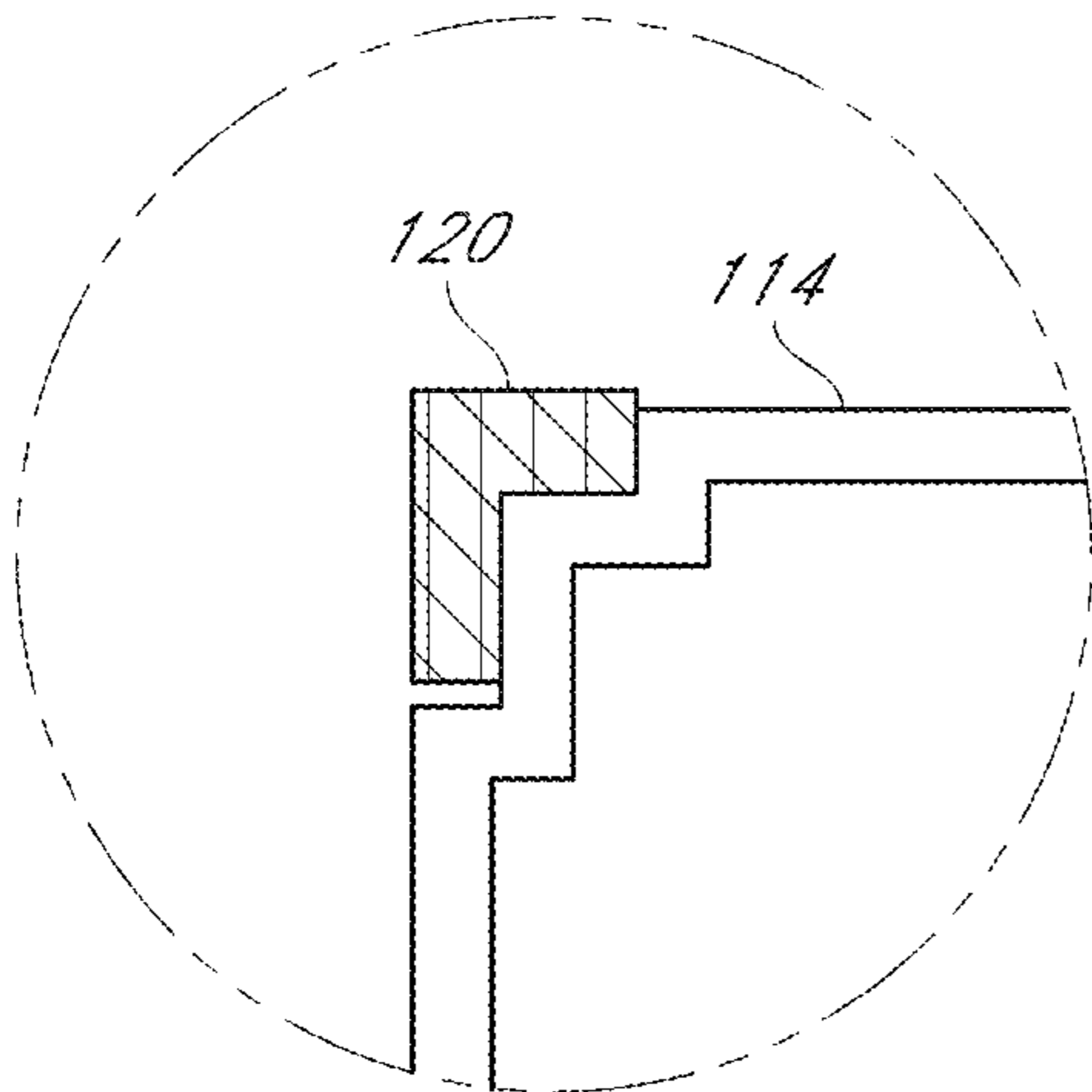


FIG. 10B

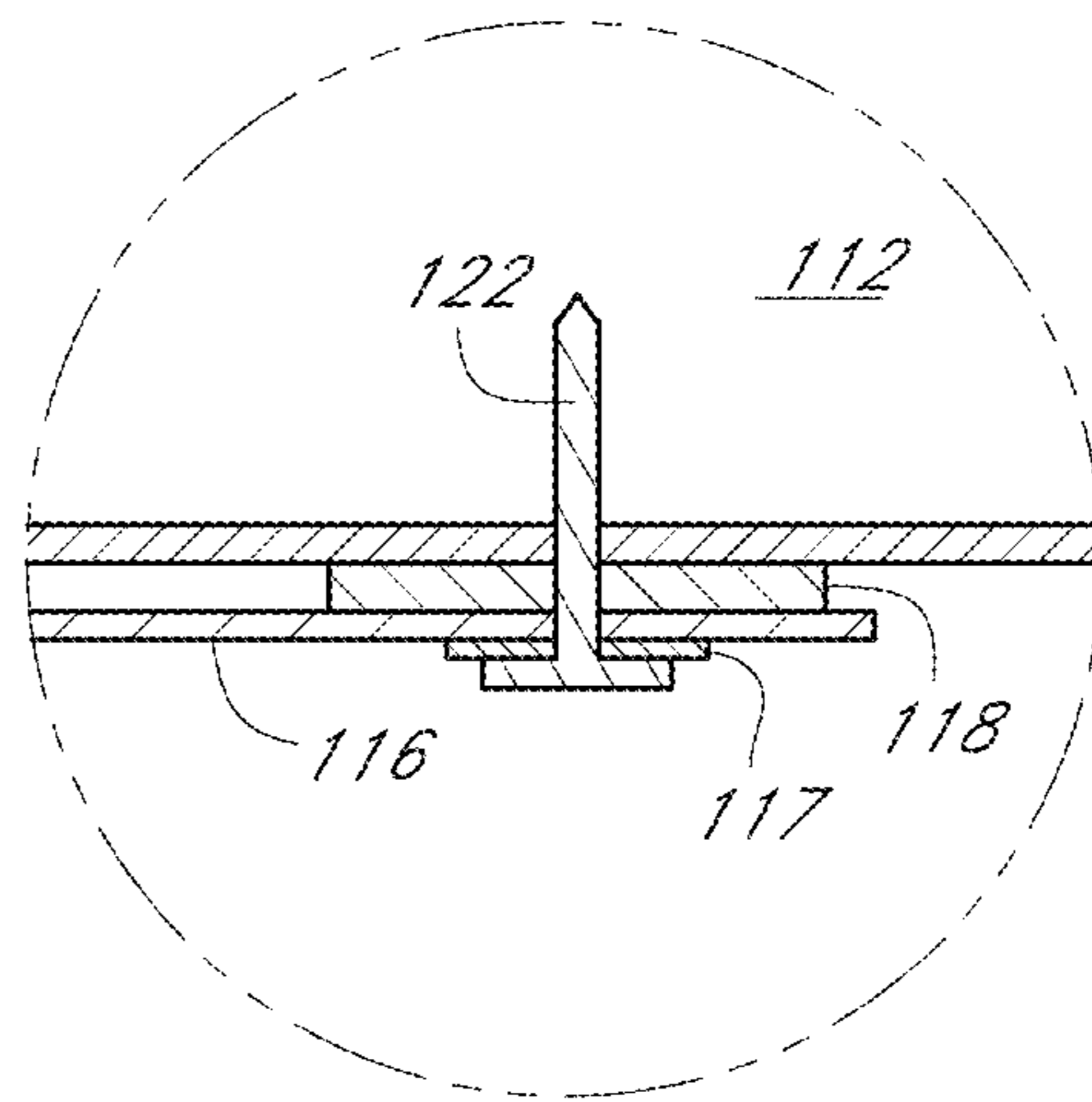


FIG. 10C

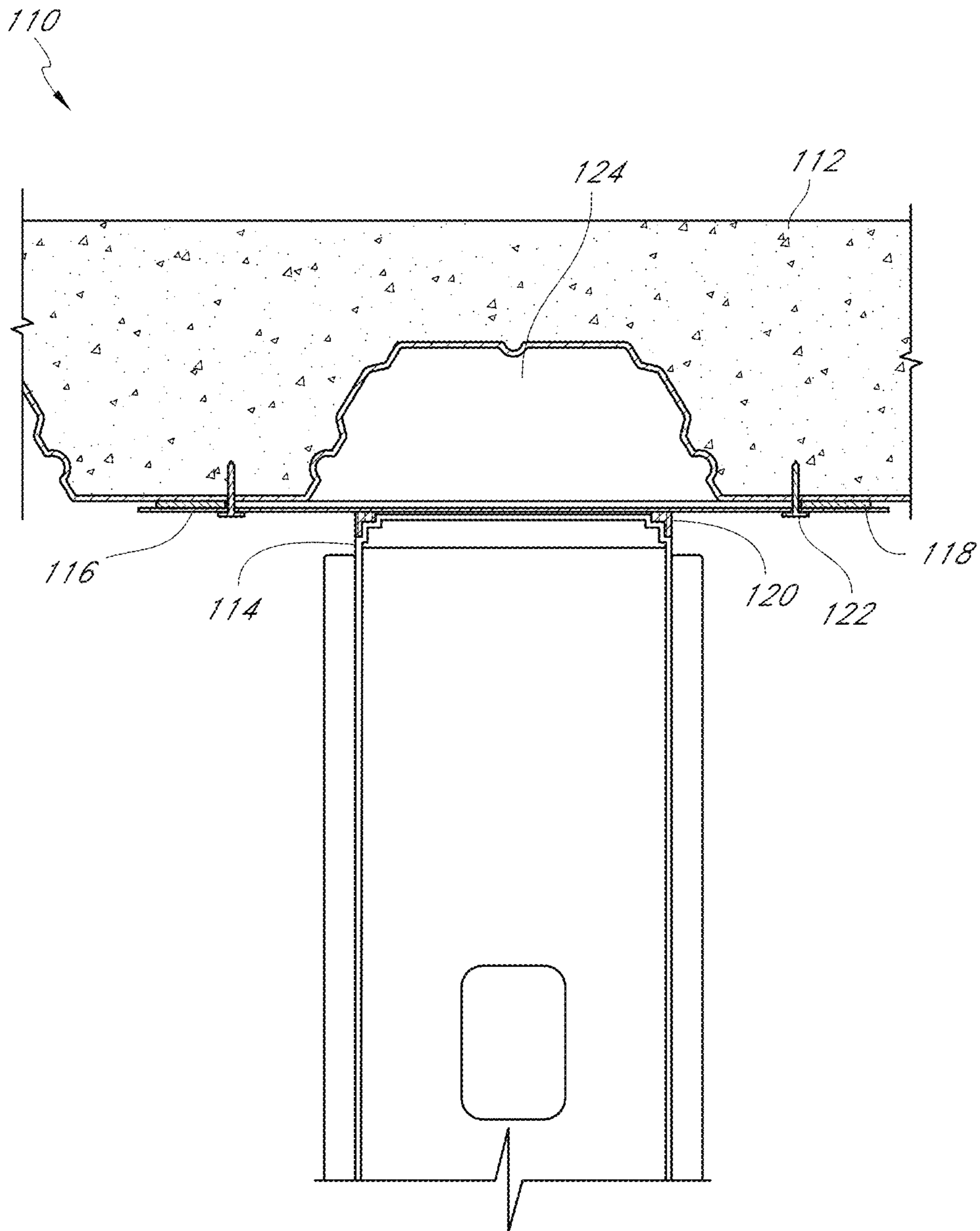


FIG. 10D

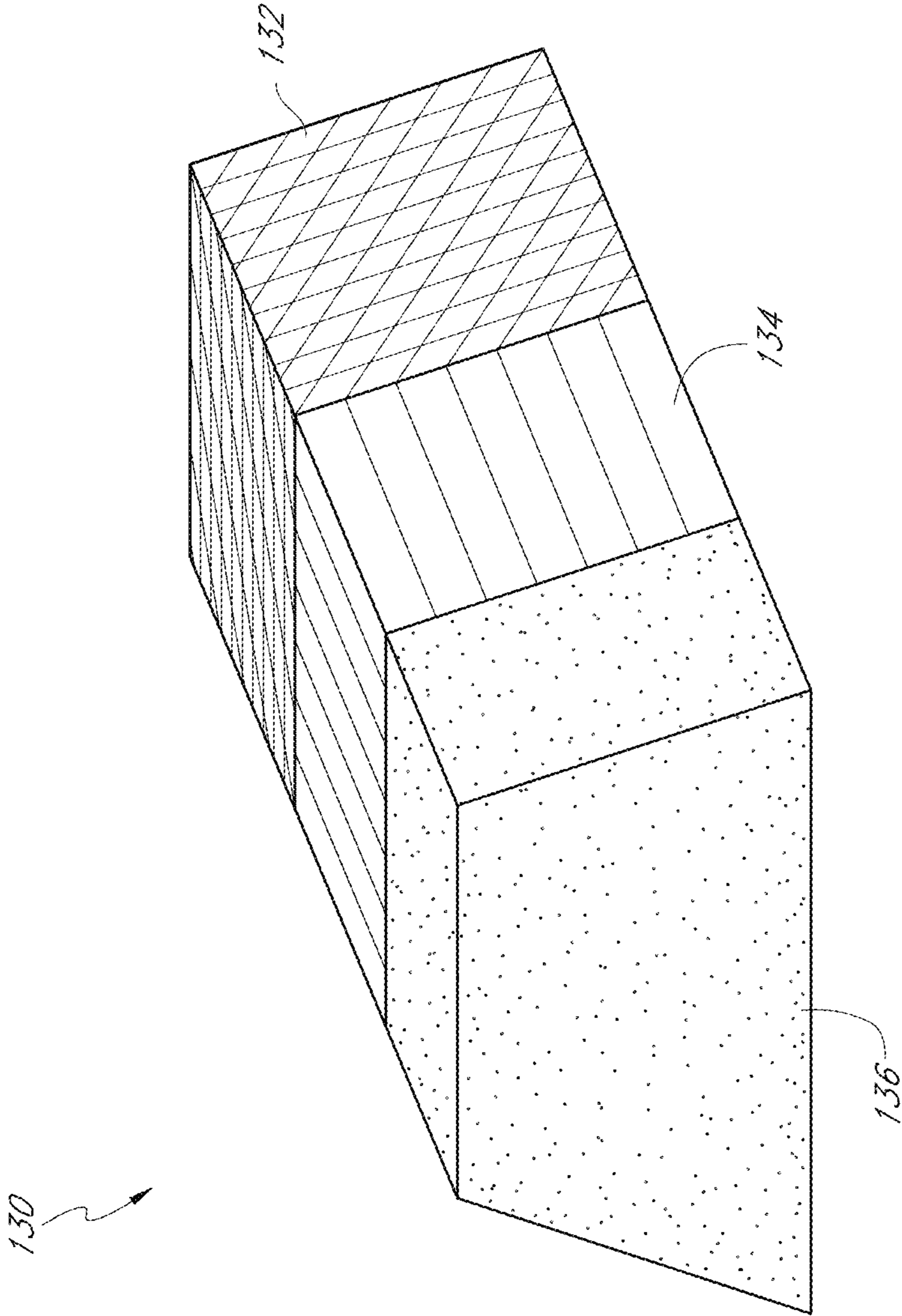


FIG. 11



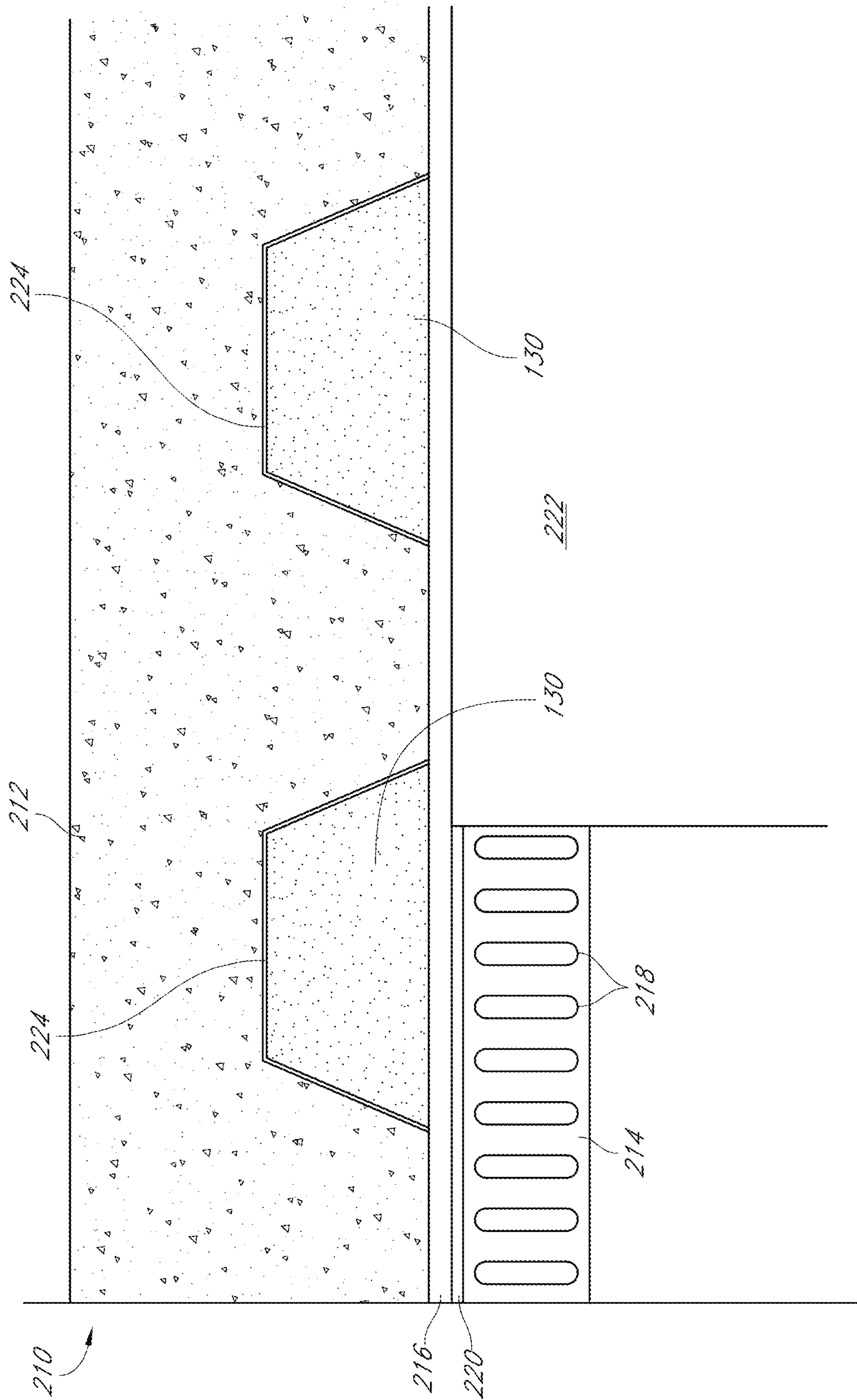


FIG. 12A

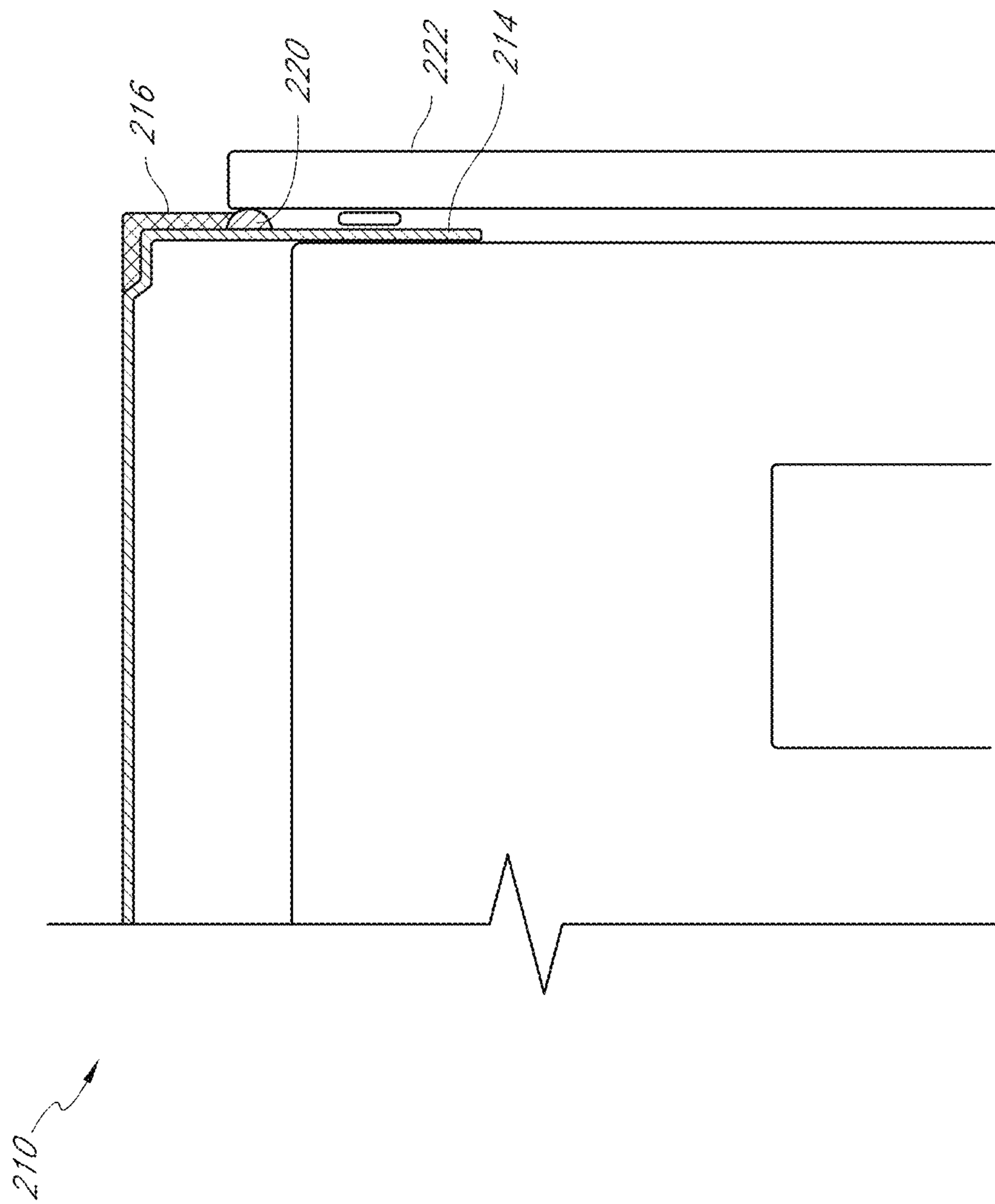


FIG. 12B

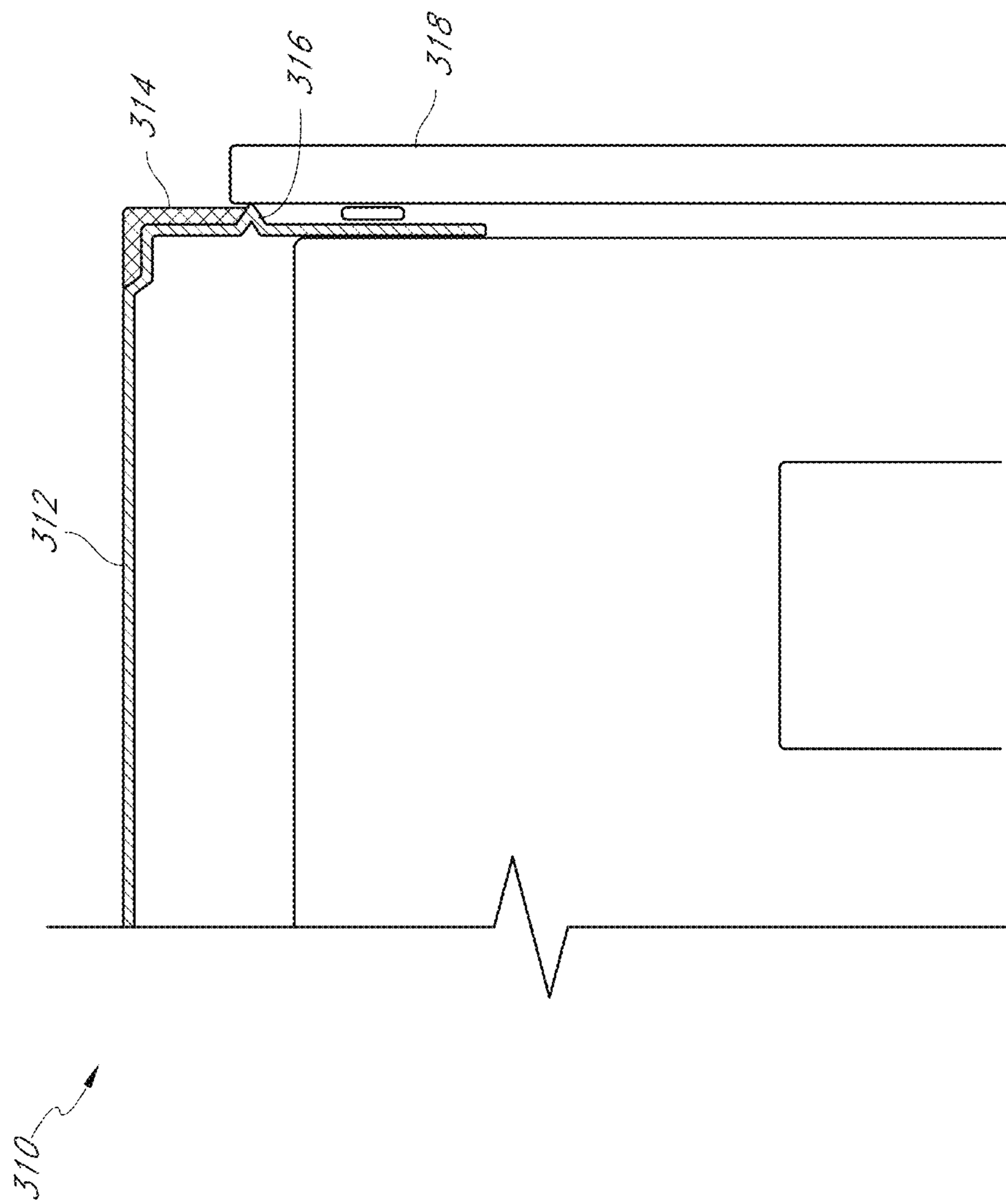


FIG. 13

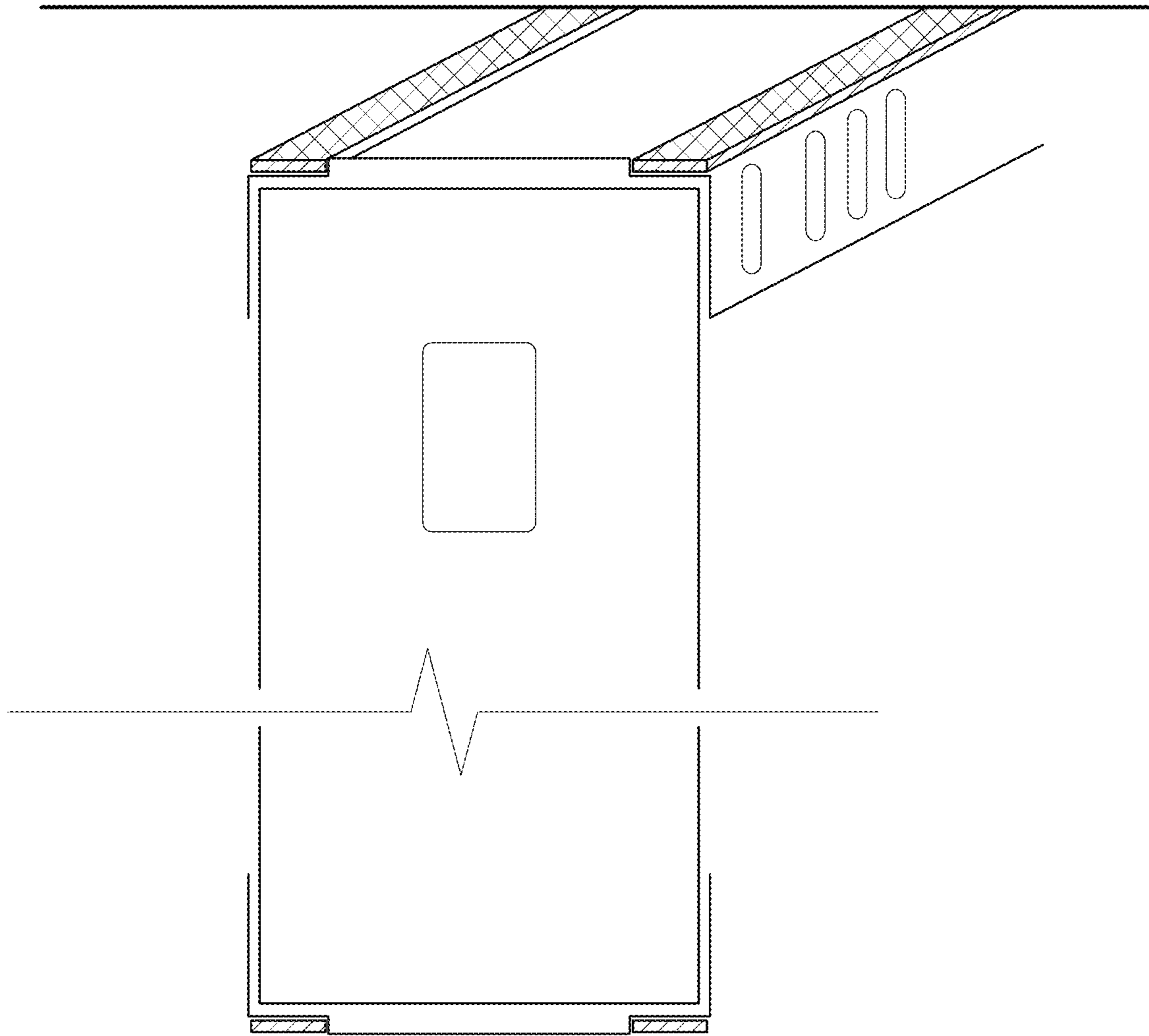


FIG. 14

**1****FIRE-RATED WALL AND CEILING SYSTEM**

## RELATED APPLICATIONS

Related applications are listed in an Application Data Sheet (ADS) accompanying this application. The entirety of each related application listed on the ADS is expressly incorporated by reference herein.

## BACKGROUND OF THE INVENTION

## Field of the Invention

This application is directed toward fire-rated wall construction components for use in building construction.

## Description of the Related Art

Fire-rated wall construction components and assemblies are commonly used in the construction industry. These components and assemblies are aimed at preventing fire, heat, and smoke from leaving one portion of a building or room and entering another, usually through vents, joints in walls, or other openings. The components often incorporate the use of a fire-retardant material which substantially blocks the path of the fire, heat, and smoke for at least some period of time. Intumescent materials work well for this purpose, since they swell and char when exposed to flames, helping to create a barrier to the fire, heat, and smoke.

One example of a fire-rated wall construction component is the Firestik® head-of-wall fireblock product. The Firestik® head-of-wall fireblock incorporates a metal profile with a layer of intumescent material on its inner surface. The metal profile of the Firestik® head-of-wall fireblock is independently and rigidly attached to a wall component, such as the bottom of a floor or ceiling, and placed adjacent to other wall components, such as a stud and track. The intumescent material, which is adhered to the inner surface of the metal profile, faces the stud and track, and the space created in between the intumescent material and the stud and track allows for independent vertical movement of the stud in the track when no fire is present.

When temperatures rise, the intumescent material on the Firestik® head-of-wall fireblock expands rapidly. This expansion creates a barrier which encompasses, or surrounds the stud and track and substantially prevents fire, heat, and smoke from moving through the spaces around the stud and track and entering an adjacent room for at least some period of time.

While the Firestik® head-of-wall fireblock serves to prevent fire, heat, and smoke from moving through wall joint openings, it also requires independent attachment and proper spacing from wall components. It would be ideal to have wall components and systems which themselves already incorporate a fire-retardant material.

An additional problem regarding current fire-rated wall components concerns ventilation. Exterior soffits for balconies or walkways are required to be fire rated. However, these soffits need to be vented to prevent the framing members from rotting. The rot is caused when airflow is taken away and condensation forms inside the framing cavity. The moisture from the condensation attacks the framing members and destroys them from the inside out. In many cases, the deterioration is not noticed until the framing is completely destroyed. Therefore, a fire-rated wall component is needed which accommodates proper ventilation

**2**

during times when no fire or elevated heat is present, and seals itself when fire or elevated heat is present.

## SUMMARY OF THE INVENTION

The present application is directed toward fire-rated wall construction components and systems for use in building construction. The term “wall,” as used herein, is a broad term, and is used in accordance with its ordinary meaning. The term may include, but is not limited to, vertical walls, ceilings, and floors. It is an object of the application to provide wall components and systems which have fire-retardant characteristics. It is also an object of the application to provide wall components and systems which allow for needed ventilation during times when no fire or elevated heat is present.

To achieve some or all of these objects, an embodiment of a wall system is provided that takes two separate components, a wall component and intumescent material, and combines the two for use in building construction. The embodiment includes at least one surface on a wall component capable of accepting intumescent material. In some embodiments, the outer surface of the intumescent material sits flush with a second surface of the wall component. This allows the wall component to retain its general shape and geometry without creating unwanted edges, protrusions, or uneven shapes. It also removes the need for a separate product or wall component to be installed outside or adjacent to a stud or track. In other arrangements, it may be desirable for the outer surface of the intumescent material to extend above the second surface of the wall component to, for example, facilitate contact between the intumescent material and another component or surface. In some arrangements, it may be desirable for the outer surface of the intumescent material to be positioned below the second surface of the wall component.

In an embodiment which resembles a vent or ventilation system, the intumescent material is positioned within an interior space of a vent. The vent may include first and second components, each including vent holes. In some arrangements, the intumescent material may include a set of holes, especially when the intumescent material is covering vent holes of the vent component(s). The term “holes,” as used herein, is a broad term, and is used in accordance with its ordinary meaning. The term includes, but is not limited to, holes, mesh, and slots. When the vent is in use, the holes in the vent surface (and, in some arrangements, the holes in the intumescent material) allow for continuous air flow through the vent. If provided, the holes in the intumescent material and the holes in the vent surface need not match up co-axially, as long as air flow is permitted. In some embodiments, the holes in the intumescent material may line up co-axially with the holes in the vent surface. Additionally, in some embodiments a flat strap may define a portion of the vent and may sit above the intumescent material. The flat strap may be a discrete piece attached separately, or may already be an integral part of the vent itself. The flat strap has its own set of holes which, when in use, allow for continuous air flow through the vent. In some embodiments the holes may be aligned co-axially with both the holes in the vent surface and the holes in the intumescent material. By having holes in both the vent and strap, air can flow through the vent, intumescent material (in some embodiments), and strap during times when there is no fire or elevated heat. When the temperature rises, however, the intumescent material will expand quickly and block air pathways. In this manner, the entire vent will be sealed, substantially prevent-

3

ing fire, heat, and smoke from reaching other rooms or parts of the building for at least some period of time. The intumescent material may be a strip of material that can be handled separately from the vent, or may be a layer of material applied to the vent (e.g., sprayed or painted onto the vent), among other possibilities.

In yet another embodiment, a wall system is provided which comprises a first wall component, a second wall component, a flat strap of material attached to the first wall component, and a strip of fire-retardant material located on the flat strap.

In yet another embodiment, a wall system is provided which comprises a deck with a flute, a wall generally aligned along the length of the flute, a flat strap located between the deck and the wall and attached to the deck, and a pair of fire-retardant material strips, one on either side of the flute, located on the flat strap between the flat strap and the deck.

In yet another embodiment, a pre-formed fire-retardant sponge is provided for use in a flute of a fluted deck, the sponge comprising a body having substantially the same shape as the shape of a flute of a fluted deck, the body being formed of compressible material and having at least one layer of fire-retardant material, and the body having an uncompressed size larger than that of the size of the flute.

In yet another embodiment, a fire-retardant wall system is provided comprising a track for receiving wall studs, the track comprising a web and flange, the track further comprising at least one surface for accepting fire-retardant material thereon, the at least one surface configured such that when the track is attached to a deck, the fire-retardant material can expand and seal any gaps present between the track and the deck when the fire-retardant material is exposed to elevated heat. The system further comprises at least one wall stud received within the track, at least one piece of drywall attached to the at least one wall stud, and an elongate protrusion or sealing element located along the flange.

In yet another embodiment, a fire-retardant wall system is provided comprising a track for receiving wall studs, the track comprising a web and flange, the track further comprising at least one surface for accepting fire-retardant material thereon, the at least one surface configured such that when the track is attached to a deck, the fire-retardant material can expand and seal any gaps present between the track and the deck when the fire-retardant material is exposed to elevated heat. The system further comprises fire-retardant material attached to the at least one surface of the track, the fire-retardant material being located along at least a portion of the flange, at least one wall stud received within the track, at least one piece of drywall attached to the at least one wall stud, and an elongate protrusion located along the flange between a free end of the flange and an edge of the fire-retardant material.

An embodiment involves a fire rated metal stud framing wall and ceiling system including a metal bottom track having a web, a first flange and a second flange. The first and second flanges extend in an upward direction from opposing side edges of the web. The bottom track defines an interior space between the web and the inwardly-facing surfaces of the first and second flanges. A plurality of metal studs are spaced from one another along the bottom track. Each of the plurality of studs has a bottom end received within the interior space of the bottom track and each of the studs extends in a generally vertical direction from the bottom track. A metal top track includes a web, a first flange and a second flange. The first and second flanges extend in a downward direction from opposing side edges of the web.

4

The top track defines an interior space between the web and the inwardly-facing surfaces of the first and second flanges. Upper ends of each of the plurality of studs are received within the interior space of the top track. At least one heat-expandable, intumescent material strip extends along a length of the top track. The intumescent material strip is attached to the top track and has at least a first surface facing the top track and a second surface. The top track is secured to a ceiling and the at least one intumescent material strip is located on the top track such that the second surface of the at least one intumescent material strip contacts the ceiling. The second surface of the at least one intumescent material strip defines a width that is less than the width of the web of the metal top track.

In some arrangements, each of the first flange and the second flange include planar portions that extend a substantial depth of the top track. The top track can include a recess defined by at least one side edge of the web, wherein the intumescent material strip is positioned within the recess. The second surface of the intumescent material strip can be opposite the first surface. The intumescent material strip can have an exposed third surface that faces the same direction as an outer surface of one of the first and second flanges. Each of the first and second flanges include a plurality of vertically-oriented slots. The at least one intumescent material strip can be a first strip and a second strip, wherein the first strip and second strip are adhesively attached to the top track along respective outermost surfaces which come in contact with the ceiling. The system can include at least one wall board coupled to the plurality of studs. The bottom track and the top track can be constructed from a cold formed steel. In some embodiments, the at least one intumescent material strip is adhesively attached to the top track.

An embodiment involves a fire rated metal stud framing wall and ceiling system including a metal bottom track having a web, a first flange and a second flange. The first and second flanges extend in an upward direction from opposing side edges of the web. The bottom track defines an interior space between the web and the inwardly-facing surfaces of the first and second flanges. A plurality of metal studs are spaced from one another along the bottom track and each of the studs has a bottom end received within the interior space of the bottom track. Each of the studs extends in a generally vertical direction from the bottom track. A metal top track includes a web, a first flange and a second flange. The first and second flanges extend in a downward direction from opposing side edges of the web. The top track defines an interior space between the web and the inwardly-facing surfaces of the first and second flanges. Upper ends of each of the plurality of studs are received within the interior space of the top track. A first heat-expandable, intumescent material strip extends along a length of the top track on a first side thereof and a second heat-expandable, intumescent material strip extends along a length of the top track on a second side thereof. The first and second intumescent material strips are attached to the top track and each have at least a first surface facing the top track and a second surface. The second surface defines a width and the combined widths of the second surfaces of the first and second intumescent material strips is less than the width of the web of the metal top track. The top track is secured to a ceiling and the first and second intumescent material strips are located on the top track such that the second surface of each of the first and second intumescent material strips contact the ceiling.

In some arrangements, each of the first flange and the second flange comprise planar portions that extend a substantial depth of the top track. The top track can also include

5

a first recess defined by a first side edge of the web and a second recess defined by a second side edge of the web, wherein the first intumescent material strip is positioned within the first recess and the second intumescent material strip is positioned within the second recess. The second surface can be opposite the first surface on each of the first and second intumescent material strips. Each of the intumescent material strips can further include an exposed third surface that faces the same direction as an outer surface of the respective one of the first and second flanges closest to the intumescent material strip. Each of the first and second flanges can include a plurality of vertically-oriented slots. At least one wall board can be coupled to the plurality of studs. The studs, the bottom track and the top track can be constructed from a cold formed steel. The first and second intumescent material strips can be adhesively attached to the top track.

Additional embodiments involve individual components of the systems described above, such as the individual flat straps, tracks or vent components, for example. In addition, embodiments of the present invention include methods of manufacturing the wall systems, vents or vent systems described above. Furthermore, other embodiments involve methods of assembling the wall systems, vents or vent systems described above.

#### BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, aspects and advantages of the various devices, systems and methods presented herein are described with reference to drawings of certain embodiments, which are intended to illustrate, but not to limit, such devices, systems, and methods. The drawings include fourteen (14) figures. It is to be understood that the attached drawings are for the purpose of illustrating concepts of the embodiments discussed herein and may not be to scale.

FIG. 1 illustrates a cross-sectional view of an embodiment of a fire-rated wall component connected to a floor and stud element.

FIG. 2 illustrates a perspective view of an embodiment of a fire-rated wall component with arcuate or curved portions.

FIG. 3 illustrates a perspective view of an embodiment of a fire-rated wall component with arcuate portions, including intumescent material.

FIG. 4 illustrates a perspective view of an embodiment of a fire-rated wall component with channels or slots and intumescent material in the slots.

FIGS. 5A and 5B illustrate perspective views of embodiments of a fire-rated wall component including holes for ventilation.

FIGS. 6A and 6B illustrate perspective views of an embodiment of a fire-rated wall component including holes for ventilation.

FIGS. 7A and 7B illustrate perspective views of an embodiment of a fire-rated wall component including holes for ventilation.

FIG. 8 illustrates a cross-sectional view of an embodiment of a fire-rated wall component with intumescent material on its top surface.

FIG. 9 illustrates a cross-sectional view of an embodiment of a fire-rated wall component with intumescent material on both its top and side surfaces.

FIG. 10A illustrates a cross-sectional view of an embodiment of a wall system with a flat strap.

FIG. 10B illustrates a cross-sectional view of the track portion of the embodiment of FIG. 10A prior to installation.

6

FIG. 10C illustrates a cross-sectional view of a portion of the embodiment of FIG. 10A.

FIG. 10D illustrates the embodiment of 10A, except with the fasteners moved in.

FIG. 11 illustrates a perspective view of an embodiment of a fire sponge.

FIG. 12A illustrates a cross-sectional view of an embodiment of a wall system which incorporates the fire sponge of FIG. 11.

FIG. 12B illustrates a cross-sectional view of a portion of the embodiment of the wall system of FIG. 12A.

FIG. 13 illustrates a cross-sectional view of an embodiment of a wall system with a protruding groove to inhibit movement of air.

FIG. 14 illustrates a cross-sectional view of an embodiment of a wall assembly.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiments of the present invention are directed toward fire-rated wall construction components and systems for use in building construction. Fire-rated wall construction components and assemblies are commonly used in the construction industry. These components and assemblies are aimed at preventing fire, heat, and smoke from leaving one portion of a building or room and entering another, usually through vents, joints in walls, or other openings. The components and assemblies often incorporate the use of some sort of fire-retardant material, such as intumescent material, which substantially blocks the path of the fire, heat, and smoke for at least some period of time. One embodiment comprises metal stud framing and intumescent and combines the two into a single component which is then incorporated into a metal stud framing wall and ceiling system. The metal stud framing wall comprises a top track with intumescent attached adhesively which allows the intumescent to be sandwiched between two hard surfaces (see FIG. 14).

FIG. 1 illustrates a cross-sectional view of an embodiment of a fire-rated wall component 10 connected to a floor or ceiling element 18 and stud element 20. The wall component 10 is used as a track for holding a stud within a vertical wall, and may include slots along its sides. The slots provide areas to accommodate fasteners for connection with the studs and allow for vertical movement of the attached studs during an earthquake or some other event where vertical movement of the studs is desired.

As can be seen in FIG. 2, wall component or header track 10 has both a flat top surface 28 and two arcuate surfaces 24 and 26. Top surface 28 is flat for ease of attachment to the bottom surface of a floor or ceiling 18. The two arcuate surfaces 24 and 26 are designed to receive intumescent material. The arcuate nature of the surfaces 24 and 26 can encourage the intumescent material, in at least some embodiments, to expand in a more radial direction from the top of the wall component 10 when subjected to elevated levels of heat, thereby filling in a larger area between and alongside the header track and floor 18. In other embodiments, the surfaces 24, 26 can have other shapes or configurations.

The intumescent material, identified as 12 and 14 in FIGS. 1 and 3, is bonded to arcuate surfaces 24 and 26. The term "bonded," as used herein, is a broad term, and is used in accordance with its ordinary meaning. The term includes, but is not limited to, mechanically bonded or bonded using adhesive. In some embodiments, when the intumescent

material is bonded, an outer surface of the intumescent material will be flush with top surface **28**. This allows top surface **28** to remain flush, or at least partially flush, with the bottom of floor element **18**, and may aid in the installation of wall component **10** to a floor or ceiling. This flush attachment additionally allows the wall component **10** to retain a fluid or smooth-shaped geometry free of added edges, overlaps, or protrusions. In doing so, the area of contact between the intumescent material and the floor element **18** can inhibit air and sound from moving past the header track **10**. In other arrangements, it may be desirable for the outer surface of the intumescent material to extend above the top surface **28** to, for example, ensure contact between the intumescent material and the floor element **18**. In some arrangements, it may be desirable for the outer surface of the intumescent material to be positioned below the second surface of the wall component.

By incorporating intumescent material onto a wall component such as a track for studs in the manner shown, it becomes unnecessary to use or attach additional features or devices to the wall component. Instead, when the temperature rises near the wall component **10**, the intumescent material **12** and/or **14** will heat up. At some point when the intumescent material becomes hot enough, it will quickly expand to multiple times its original volume. This intumescent material will expand towards the floor or ceiling element **18** and outwards toward any open space. This helps to substantially prevent fire, heat, and smoke from moving past, through, or around wall component **10** and stud **20** for at least some period of time.

FIG. **4** illustrates another embodiment of a fire-rated wall component **32**. In this embodiment, the wall component **32** again takes the form of a track member for use in holding studs in place within a vertical wall. However, here the wall component **32** has two slots or channels, shown as **34** and **36**, wherein the intumescent material **40** and **42** is attached. As can be seen in the drawing, the top surface layers of intumescent material **40** and **42** are flush with the top surface **38** of wall component **32**. This allows the top surface **38** of wall component **32** to maintain a smooth geometry, which may aid in the installation of wall component **32** to a floor, ceiling or intersecting wall. This flush attachment additionally allows the wall component **10** to retain a fluid or smooth-shaped geometry free of added edges, overlaps, or protrusions. However, a flush attachment as described above is not essential to the success of the present invention.

It is possible that more than two slots could be used in the type of embodiment shown in FIG. **4**, or even as few as one. The purpose of having the intumescent material located in the slots **34** and **36** is to create fire protection areas. When the intumescent material **40** and **42** becomes hot, it will expand rapidly into the open areas around it. Much as in the embodiment shown in FIGS. **1-3**, this expansion will help to create a barrier, or seal, substantially preventing fire, heat, and smoke from moving from one area of a building to another for at least some period of time.

FIGS. **5A** and **5B** illustrate other embodiments of a fire-rated wall component **46**. Here, the wall component takes the form of a soffit vent. The wall component **46** has a lower ventilation area **48** which includes a set or series of ventilation holes. These holes, which are hidden from view in FIGS. **5A** and **5B**, but are shown in FIG. **6B**, allow air and other matter to travel between floors and rooms in a building, or between the outside of a building and the interior of a building.

As can be seen in FIG. **5A**, a strip of intumescent material **50** is provided within the vent **46** and above ventilation area

**48**. The intumescent material **50** may be loosely positioned within the vent **46** or, as illustrated, may be attached adjacent to one or more components of the vent **46**. The top surface of the intumescent material is flush with the top surface **54** of wall component **46**. This allows for easy installation and use of a flat strap **52**, which may be a separate member from the vent **46** or may be integrated with the vent **46**. A flush fit, however, is not essential to the success of the present invention.

In some arrangements, especially if covering the holes of the ventilation area **48**, the intumescent material **50** may be provided with a series of surfaces defining holes. These holes are hidden from view in FIGS. **5A** and **5B** but are shown in FIG. **6A**. The holes allow air and other matter to continue to travel between floors and rooms in a building, or between the outside of a building and the interior of a building. Flat strap **52** also has a series of holes **60** located in its center area. This series of holes, much like the ventilation and intumescent material holes, allows air and other matter to travel between floors and rooms in a building, or between the outside of a building and the interior of a building.

The intumescent material **50** may occupy a portion or all of the interior space defined by the vent **46**. In one or more arrangements, the intumescent material **50** occupies only a portion of the interior space to facilitate air flow through the vent **46**. When the intumescent material **50** becomes hot, it will expand to many times its original size into the open areas around it. Much as in the embodiments shown in FIGS. **1-4**, this expansion will help to create a barrier, or seal, inhibiting or at least substantially preventing fire, heat, and smoke from moving from one area of a building to another for at least some period of time.

FIGS. **6A** and **6B** illustrate another embodiment of a fire-rated wall component **56**. In FIG. **6A**, intumescent material holes **58** are visible, and the intumescent material **50** extends along the sides of vent area **48**. When the intumescent material **50** becomes hot, it expands rapidly, filling much if not all of the space underneath the flat strap **52**. This expansion substantially cuts off at least a substantial amount of air movement through the vent surface **48**, and inhibits or at least substantially prevents fire, heat, and smoke from moving through the vent for at least some period of time. As can be seen in the embodiment in FIG. **6A**, the flat strap **52** is formed as an integral part of the wall component **56**. In other embodiments, the flat strap **52** may be a discrete piece attached separately.

FIG. **6B** illustrates the bottom view of fire-rated wall component **56**.

Here, ventilation holes **68** can be seen in the vent area **48**. The intumescent material **50** is attached to both the vent area **48** and along its extended sides. The intumescent material **50** can be a single piece of material, or can be made up of several pieces. The intumescent material **50** can be secured to the strap **52** or wall component **56** by any suitable means. For example, in one arrangement, the intumescent material **50** includes an adhesive backing, which permits the intumescent material **50** to be secured to the strap **52** or wall component **56**. In an alternative arrangement, the intumescent material **50** may be secured to the strap **52** or wall component **56** by a mechanical fastener, such as a screw or rivet, for example. Other suitable mechanisms or methods may also be used. The intumescent material **50** may be secured to the strap **52** or wall component **56** during the manufacturing process or in the field.

FIGS. **7A** and **7B** illustrate another embodiment of a fire-rated wall component **66**. With reference to FIG. **7A**, the



wall component 66 can include a flat strap 52 with intumescent material 50 attached underneath, such that the intumescent material faces the inside area of the vent. In at least some embodiments the flat strap can comprise 20 gauge sheet metal, and the intumescent material can be about 2 mm thick and about 1/4" wide. Other gauges, sizes, and shapes are also possible. The intumescent material can be attached to the flat strap 52 by various means, including but not limited to adhesive tape and/or mechanical fasteners. The flat strap 52 can be a discrete piece attached separately to the top surface 54, or can be formed as an integral part of the wall component, as shown in FIG. 6A. In some embodiments, the flat strap 52 can include expanded metal lathes along either side with slots or holes 60, and an area in between for attachment of the intumescent material 50. In some embodiments, the holes 60 can be about 1/4" wide and about 1/2" wide. Other sizes are also possible.

With continued reference to FIG. 7A, the wall component 66 can allow air movement through the vent when the intumescent material 50 has not expanded. The air can move through holes 68 into the open space inside the vent and then out through slots or holes 60. In at least some embodiments the holes 68 can be about 1/8" in diameter. Other sizes and shapes are also possible. When the intumescent material expands, it can cover up either or both sets of holes 68, 60, in order to inhibit fire, heat, and smoke from moving through the vent.

With reference to FIG. 7B, in some embodiments the intumescent material can instead be placed on the lower portion of the vent itself as opposed to the bottom of the flat strap 52. Holes 68 can be located on one or both sides of the intumescent material along the bottom of the vent, and slots or holes 60 can be located along the flat strap 52. Just as with the embodiment shown in FIG. 7A, the intumescent material 50 can expand to cover up holes 60 and/or 68 when exposed to elevated levels of heat, inhibiting fire, heat, and smoke from moving through the vent. In at least some embodiments the top of the vent can have at least one end that wraps about the flat strap 52 to help hold it in place, as shown in FIG. 7B.

In yet other embodiments, the intumescent material, or other fire-retardant material, can be sprayed or painted onto one or both sides of the bottom of the vent or onto the flat strap. The spray or paint can cover areas which surround the holes 68. When exposed to heat, the fire-retardant material can expand to cover the holes 68, thereby inhibiting fire, heat, and smoke from moving through the vent.

FIG. 8 illustrates another embodiment of a fire-rated wall component 72. In this embodiment, the wall component 72 is a track for holding a wall stud 20 beneath a ceiling 18. Here, the intumescent material 74 is attached to the top surface of the wall component 72. During installation, it is possible to install the wall component 72 and intumescent material 74 to the ceiling 18. In some embodiments, this may be accomplished by threading a screw through both the wall component and intumescent material. Additionally, in some embodiments the intumescent material may extend down one or both sides of the wall component 72.

FIG. 9 illustrates another embodiment of a fire-rated wall component 80. In this embodiment, the wall component 80 is a track for holding a wall stud. However, here the intumescent material 84 extends both along a portion of the top and side surfaces of the wall component 80. In particular, intumescent material is provided on the side and top surfaces of each corner portion of the wall component 80. In some embodiments, an outer surface of the intumescent material 84 may be flush with the top surface 82. In other embodiments, the intumescent material 84 may extend above the

adjacent surfaces of the wall component 80, or may be positioned below the adjacent surfaces of the wall component 80.

With reference to FIG. 10A, a fire-retardant wall system 110 can comprise a first wall component 112, a second wall component 114, a flat strap 116, and at least one strip of fire-retardant material 118. In at least some embodiments the first wall component 112 can comprise a fluted deck such as the one illustrated in FIG. 10A. In yet other embodiments the first wall component 112 can comprise a floor, ceiling, overhang, or any other type of wall component.

In at least some embodiments the second wall component 114 can comprise a track, or header track, such as the one illustrated in FIG. 10A, for retaining wall studs. The header track can comprise a slotted header track. In yet other embodiments the second wall component can comprise a different type of track or wall component.

With reference to FIGS. 10A and 10B, the second wall component 114 can include at least one gasket 120. The gasket 120 can itself comprise a strip of fire-retardant material, including but not limited to intumescent material. In at least some embodiments, the gasket 120 can be adhered to a surface of the second wall component 114 such that when the second wall component is attached to, pressed, and/or placed against the fire strap 116, the gasket or gaskets 120 can form a sound and/or air seal, inhibiting sound and/or air from moving from one side of the second wall component 114 to the other. For example, and with reference to FIG. 10B, in at least some embodiments the gasket can be adhered to the second wall component 114 such that a portion of it protrudes and/or extends past an adjacent edge of the second wall component 114. When the second wall component 114 is pressed against and/or attached to the flat strap 116 or other wall component, the portion of the gasket protruding past the edge can be compressed down towards the adjacent edge of the wall component 114 in order to form a seal between the flat strap 116 and second wall component 114. As described above, this seal and contact can inhibit air and sound from moving past the second wall component 114.

The flat strap 116 can be attached to the first wall component, the second wall component, or both the first and second wall components. For example, and as illustrated in FIG. 10A, the flat strap 116 can be attached via fasteners 122 to the first wall component 112. In at least some embodiments, the flat strap 116 can comprise an about 6"-8" wide 20 gauge flat strap. The flat strap 116 can be used to cover a portion or all of one or more flutes 124 of the fluted deck 112, FIG. 10A showing a cross-section of the flute 124. Thus, the flat strap 116 provides a surface for the second wall component 114 to contact when the wall component 114 is generally aligned with the length of the flute 124, or when the wall component 114 extends generally alongside and underneath the length of the flute 124 as shown in FIG. 10A. In other embodiments a portion or portions of the wall component 114 can be aligned with a portion of the fluted deck that does not include the flute 124.

With reference to FIGS. 10A-10D, the strip of fire-retardant material 118 can comprise intumescent material, which expands when subjected to elevated levels of heat, or can comprise other types of fire retardant material. In some embodiments an about 1/2" thick strip of material can be used. Other thicknesses are also possible.

In at least some embodiments, and with reference to FIG. 10C, the strip of fire-retardant material 118 can be adhered to the flat strap so that it rests between the flat strap 116 and first wall component 112. In at least some embodiments, the

## 11

fire-retardant system **110** can include two or more strips of fire-retardant material **118**. In some embodiments, the strips of fire-retardant material **118** can be located approximately ¼" in from the ends of the flat strap **116**. For example, and with reference to FIG. **10A**, the system **110** can include one strip of fire-retardant material **118** located on each side of the second wall component **114** and on each side of the flute **124**.

In at least some embodiments, and with reference to FIGS. **10A** and **10C**, the strip of fire-retardant material **118** can include a preformed fastener hole for insertion of the fastener **122**. The fastener **122** can be fastened through the fire-retardant material **118**. A washer **117** can be used between a head of the fastener **122** and the flat strap **116** to help secure the flat strap **116**. The fastener **122** can help to secure the fire-retardant material in place. In other embodiments, and with reference to FIG. **10D**, the fastener **122** can be located adjacent or inside of the fire-retardant material **118** along the flat strap **116**.

In some embodiments, the fasteners **122** can be located every 12" on center along the length of the flat strap. In order to locate the areas for attachment, in at least some embodiments, the flat strap **116** can include the preformed fastener hole, as described above, or other suitable markings. For example, in some embodiments the flat strap can be indented, scored, or a laser or inkjet (or other suitable) line can be placed along the length of the flat strap **116**, to help locate where the fasteners **122** should be installed through the fire-retardant material and into the wall component **112**.

With continued reference to FIGS. **10A-10D**, the fire-retardant system **110** can inhibit fire, smoke, air, sound, and/or debris from moving from one side of the second wall component **114** to the other (e.g. from one room to another inside a building). The strip or strips of fire-retardant material **118** and/or **120** can act as gaskets, preventing air and/or sound from moving past the system **110**. At the same time, when the strips **118** and/or **120** are exposed to elevated levels of heat, they can expand and fill any gaps left between the flat strap **116** and first and second wall components **112**, **114**.

The flat strap **116** with fire-retardant material **118** can be used with other systems, decks, tracks, or wall components as well. Thus, it is not limited to use with a fluted wall component and/or header track, as illustrated in FIGS. **10A-10D**.

With reference to FIGS. **11** and **12**, a fire sponge **130** can be used to prevent the spread of fire, heat, and/or debris. The fire sponge **130** can be sized and shaped so that it is custom-made for particular sized and shaped spaces. For example, the fire sponge **130** can be shaped so that it fits snugly into the hollow area or areas of a fluted deck.

With continued reference to FIG. **11**, the fire sponge **130** can comprise an inner layer of material **132**, such as for example mineral wool. The inner layer **132** can be compressible, so that the entire sponge **130** can be compressed into an area smaller than the volume of the fire sponge **130** itself. The fire sponge **130** can further comprise another layer of material **134** outside of the inner layer **132**. In some arrangements, the layer of material **134** can be the outermost layer, and in other arrangements can be an intermediate layer. In at least some embodiments the layer of material **132** can comprise fire-retardant material, including but not limited to intumescent material. In at least some embodiments, the fire sponge **130** can further comprise an additional outer layer of material **136**, including but not limited to latex smoke seal. In one preferred embodiment, the outer layer of latex smoke seal can range between ¼" - ⅜" in thickness. This outer layer of latex smoke seal can give the fire sponge

## 12

**130** a flexible, yet durable shape. For example, the latex can prevent wear and tear during shipping and/or installation, and can also prevent smoke from moving through the fire sponge **130**.

With reference to FIGS. **11** and **12A**, the custom-made and pre-shaped fire sponges **130** can be made to have a trapezoidal cross-section so as to fit into the generally trapezoidal-shaped flutes commonly found in decks. In at least some embodiments, the trapezoidal-shaped fire sponge **130** can have widths which are larger than the widths of the flute. Other shapes and geometries are also possible. In some embodiments, the fire sponge **130** can be made at least in part of a compressible material, and its initial manufactured size can be larger than that of the flute **124**. This allows the sponge **130** to be compressed to fit inside the flute **124**, and once inside to expand and hold itself in place. For example, in at least one embodiment, the fire sponge **130** can be made to compress by approximately 30% of its initial volume to fit inside the flute **124**. Other percentages and/or ranges of percentages are also possible.

Custom-made and pre-shaped fire sponges can reduce the amount of time required for fire-proofing the interior of a building, particularly if the size of the fluted wall components is known. For example, instead of placing or stuffing numerous, similar-shaped fire blocks or material into a hollow area and then using an airless sprayer to spray latex smoke sealer, a single custom-shaped fire sponge as described above can be used.

With continued reference to FIG. **12A**, a fire-retardant wall system **210** can include a first fluted wall component **212** and a second, attached wall component **214**. In at least some embodiments the first fluted wall component **212** can comprise a fluted deck, and can include hollow areas for insertion of a fire sponge or sponges **130**. In at least some embodiments, the sponges **130** can be inserted after the second wall component **214** has been attached to the fluted wall component **212**.

With reference to FIGS. **12A** and **12B**, in at least some embodiments the second wall component **214** can comprise a header track, which may be slotted or unslotted. In some embodiments the track can have a U-shape. In other embodiments it can have a J-shape. Other shapes are also possible. In at least some embodiments the track can be used for shaft areas in buildings, including but not limited to elevator shafts. In such arrangements, the structures for sealing with wallboard members described below may be provided on only one side of the track because the shaft side typically does not include wallboard.

With continued reference to FIGS. **12A** and **12B**, the illustrated header track is slotted and can comprise a strip or strips of fire-retardant material **216**, including but not limited to intumescent material, along at least one flange. The strip of fire-retardant material **216** can be located along an area of the flange adjacent and/or proximal to the series of slots **218** in the flange. As illustrated in FIG. **12A**, the second wall component **214** can extend along the bottom of the fluted wall component **212**, generally perpendicular to the lengths of the flutes **224**.

The second wall component **214** can further comprise a strip or strips of a sealing element **220** located between the strip **216** and series of slots **218**, and also between the strip **216** and a piece or pieces of an outer wallboard member, such as a sheet of drywall **222**, or other exterior material. The sealing element **220** can be a separate component from the track **214** such as, for example, caulk, foam or tape, and can be used to prevent or inhibit air from moving between the drywall and the second wall component **214**. Alterna-

## 13

tively, as described below, the sealing element can be formed by the track itself. For example, and with reference to FIG. 12B, the sealing element 220 can extend away from the flange and towards the drywall 222 such that the drywall 222 is able to rest against a portion of the sealing element 220. This configuration can help prevent air from moving between the drywall 222 and the track, while at the same time preventing the drywall from covering up or moving over and interfering with the fire-retardant material 216.

With reference to FIG. 13, other structures or embodiments for preventing unwanted airflow are also possible. For example, a fire-retardant wall system 310 can comprise a slotted or unslotted track 312. In the illustrated arrangement, the track 312 is slotted. The slotted track 312 can comprise at least one surface for accepting fire-retardant material 314 thereon. The at least one surface can be configured such that when the track is attached to a first wall component, the fire-retardant material 314 can expand and seal a gap between the slotted track 312 and first wall component when the fire-retardant material is exposed to elevated heat. The track 312 can also comprise an elongate protrusion or rib 316 located along at least a portion of one or more of the flanges of the track and proximal the at least one surface, as illustrated in FIG. 13.

In at least some embodiments, the elongate protrusion 316 can have a generally v-shaped cross section. Other cross-section shapes are also possible, for example, the protrusion 316 can be generally u-shaped or trapezoidal in shape. The elongate protrusion 316 can act as both a boundary area for the fire-retardant material, as well as a resting and/or attachment location for a piece of drywall 318, or other exterior material. The drywall can rest and/or remain in contact with the elongate protrusion 316, thereby blocking air from moving between the drywall 318 and slotted track 312. At the same time, the elongate protrusion 316 can help prevent the drywall 318 from contacting and/or interfering with the fire-retardant material 314.

In some embodiments, the drywall is fastened to a stud within the slotted track 312. The head portion 320 of the fastener can tend to bow out the drywall, leaving a gap at the top of the drywall to allow air, sound, or debris in general to move between the drywall and the slotted track 312. The sealing element 220 and/or elongate protrusion 316 can have depths large enough such that even if the drywall is bowed out, the drywall remains in contact with the sealing element 220 and/or elongate protrusion 316. For example, in some embodiments, the sealing element 220 and/or protrusion 316 can have depths at least equivalent to the depth of the fastener head 320. As described above, the track can be configured for use in a shaft wall application. In such an arrangement, the track may include fire-retardant material 216 or 314 and the sealing element 220 or protrusion 316 on only one side (i.e., the side opposite the shaft). The flange of the track facing the shaft may be the same or a different length (shorter or longer) than the opposite flange. In some applications, it may be desirable for the shaft flange to be longer than the opposite flange.

The present application does not seek to limit itself to only those embodiments discussed above. Other embodiments resembling tracks, vents, or other wall components are possible as well. Various geometries and designs may be used in the wall components to accommodate the use of fire-retardant material. Additionally, various materials may be used. In at least some embodiments the wall component and wall system materials can comprise steel, iron, or other material having at least some structural capacity. The fire-retardant materials can comprise intumescent material, such

## 14

as for example BlazeSeal™, or some other material which accomplishes the same purposes as those described above.

Although these inventions have been disclosed in the context of certain preferred embodiments and examples, it will be understood by those skilled in the art that the present inventions extend beyond the specifically disclosed embodiments to other alternative embodiments and/or uses of the inventions and obvious modifications and equivalents thereof. In addition, while several variations of the inventions have been shown and described in detail, other modifications, which are within the scope of these inventions, will be readily apparent to those of skill in the art based upon this disclosure. It is also contemplated that various combinations or sub-combinations of the specific features and aspects of the embodiments can be made and still fall within the scope of the inventions. It should be understood that various features and aspects of the disclosed embodiments can be combined with or substituted for one another in order to form varying modes of the disclosed inventions. Thus, it is intended that the scope of at least some of the present inventions herein disclosed should not be limited by the particular disclosed embodiments described above.

What is claimed is:

1. A head-of-wall assembly comprising:
  - an overhead, fluted pan deck having a plurality of elongate hollow spaces separated by lower surfaces;
  - a header track having first and second flanges connected by a web, the header track coupled with the lower surfaces of the overhead, fluted pan deck at the web;
  - a plurality of studs coupled with the header track;
  - a wallboard coupled with the plurality of studs;
  - a pre-shaped fire sponge having a cross-sectional shape and comprising:
    - an inner layer comprising a compressible material; and
    - an outer layer encompassing the inner layer;
 wherein the pre-shaped fire sponge is positioned above the header track within one elongate hollow space of the plurality of elongate hollow spaces to block passage of smoke and/or fire through the one elongate hollow space;
 wherein the pre-shaped fire sponge is compressed along at least one dimension within the one elongate hollow space;
 wherein an entirety of the pre-shaped fire sponge is above an upper plane of the header track.
2. The head-of-wall assembly of claim 1, wherein the outer layer is an outermost layer.
3. The head-of-wall assembly of claim 1, wherein the outer layer comprises a polymer material.
4. The head-of-wall assembly of claim 1, wherein the outer layer comprises a latex material.
5. The head-of-wall assembly of claim 1, wherein outer layer has a thickness between  $\frac{1}{16}$  inch and  $\frac{1}{8}$  inch.
6. The head-of-wall assembly of claim 1, wherein the outer layer comprises a smoke seal material.
7. The head-of-wall assembly of claim 1, wherein the outer layer is flexible.
8. The head-of-wall assembly of claim 1, wherein the outer layer comprises a heat-resistant material.
9. The head-of-wall assembly of claim 1, wherein the outer layer maintains the cross-sectional shape of pre-shaped fire sponge.
10. The head-of-wall assembly of claim 1, wherein the one elongate hollow space has a trapezoidal cross-sectional shape and the cross-sectional shape of pre-shaped fire sponge is trapezoidal.

## 15

11. The head-of-wall assembly of claim 1, wherein the outer layer prevents passage of smoke through the inner layer.

12. The head-of-wall assembly of claim 1, wherein the compressible material of the inner layer comprises mineral wool.

13. The head-of-wall assembly of claim 1, wherein the compressible material of the inner layer is compressed by approximately 30%.

14. The head-of-wall assembly of claim 1, wherein the inner compressible material of the inner layer is compressed by the outer layer.

15. The head-of-wall assembly of claim 1, wherein the pre-shaped fire sponge is compressed to fit within the one elongate hollow space within the pan deck above the header track, the pre-shaped fire sponge expands after placement within the one elongate hollow space to hold itself in place.

16. The head-of-wall assembly of claim 1, further comprising a fire-retardant material strip coupled with and extending along the header track.

17. The head-of-wall assembly of claim 1, further comprising a sealing element material strip coupled with and extending along the header track.

18. The head-of-wall assembly of claim 1, wherein the compressible material of the inner layer comprises an intumescent material.

19. The head-of-wall assembly of claim 1, further comprising:

a second pre-shaped fire sponge, separate from the first pre-shaped fire sponge, comprising:

an inner layer comprising a compressible material; and an outer layer encompassing the inner layer;

wherein the second pre-shaped fire sponge is positioned above the header track within a second elongate hollow space of the plurality of elongate hollow spaces to block passage of smoke and/or fire through the second elongate hollow space.

20. A head-of-wall assembly comprising:

an overhead, fluted pan deck having a plurality of elongate hollow spaces separated by lower surfaces;

## 16

a header track having first and second flanges connected by a web, the header track coupled with the lower surfaces of the overhead, fluted pan deck at the web and extending along a first direction transverse to the plurality of elongate hollow spaces;

a plurality of studs coupled with the header track;

a wallboard coupled with the plurality of studs;

a pre-shaped fire sponge comprising:

an inner layer comprising a compressible material; and

an outer layer encompassing the inner layer;

wherein the pre-shaped fire sponge is positioned within one elongate hollow space of the plurality of elongate hollow spaces to block passage of smoke and/or fire through the one elongate hollow space;

wherein a maximum width of the outer layer of the pre-shaped fire sponge in the first direction is less than a maximum width of the one elongate hollow space in the first direction.

21. The head-of-wall assembly of claim 20, wherein the outer layer is an outermost layer.

22. The head-of-wall assembly of claim 20, wherein the pre-shaped fire sponge is compressed along at least one dimension within the one elongate hollow space.

23. The head-of-wall assembly of claim 20, wherein the compressible material of the inner layer comprises mineral wool.

24. The head-of-wall assembly of claim 20, wherein the compressible material of the inner layer is compressed by approximately 30%.

25. The head-of-wall assembly of claim 20, wherein the inner compressible material of the inner layer is compressed by the outer layer.

26. The head-of-wall assembly of claim 20, wherein the pre-shaped fire sponge is compressed to fit within the one elongate hollow space within the pan deck above the header track, the pre-shaped fire sponge expands after placement within the one elongate hollow space to hold itself in place.

\* \* \* \* \*